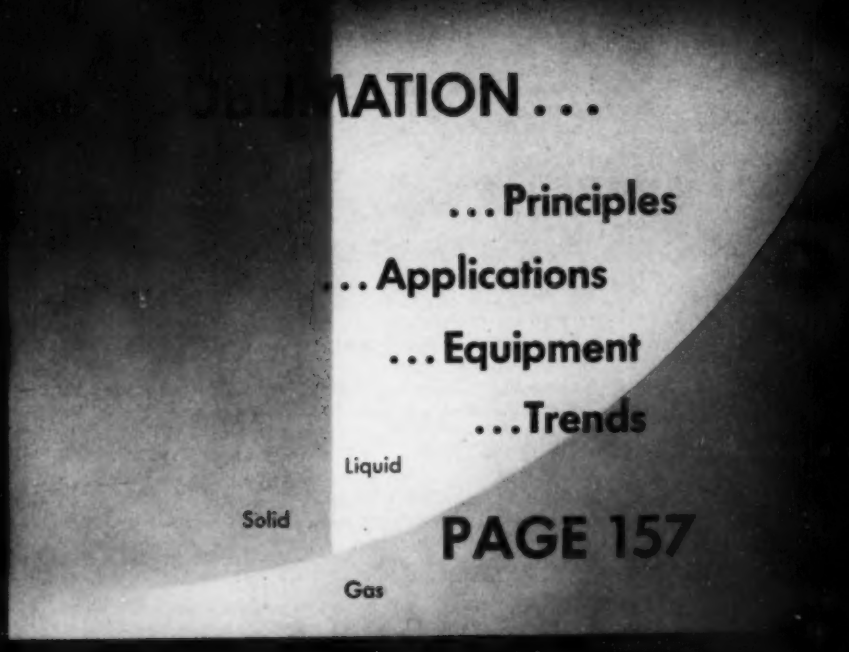
SEPTEMBER
1951

Chemical Engineering



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1951

Chemical Engineering

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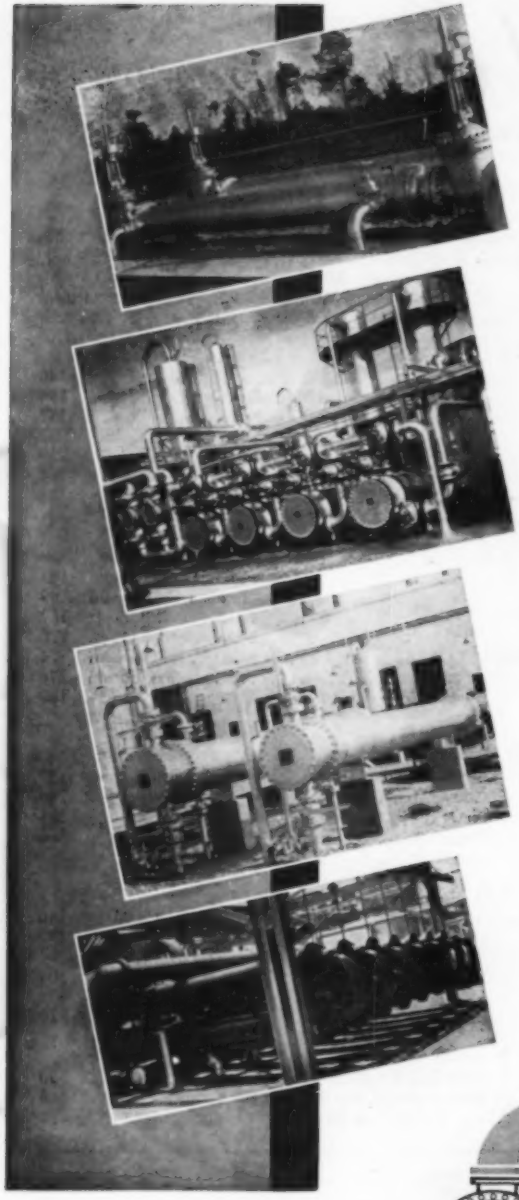

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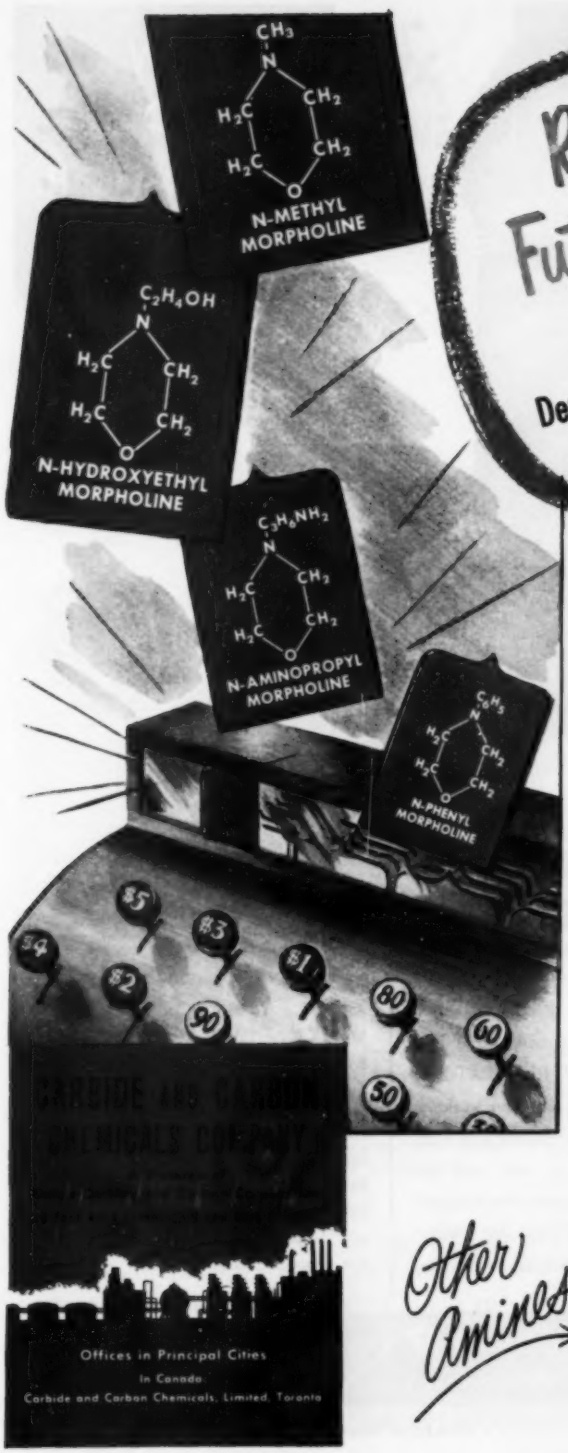

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Few other groups of organic chemicals have the diverse solvent powers of the N-substituted morpholines. The fact that they are both ethers and tertiary amines (N-Hydroxyethyl Morpholine is also an alcohol) probably accounts for the unique solvent activity that gives them such wide potential use.

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- Methyl Morpholine for the preparation of self-polishing wax and oil emulsions.
- Esters of Hydroxyethyl Morpholine as emulsifiers in metal-cutting oils and textile oils.
- Phenyl Morpholine for the preparation of dyes and as a corrosion inhibitor for tin alloys.

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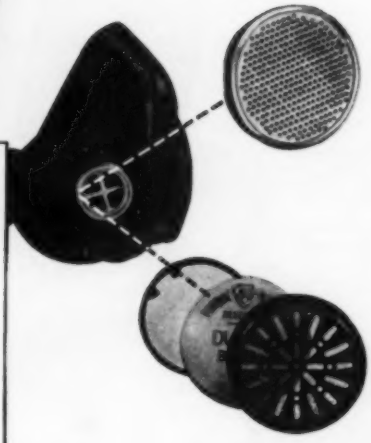
Other Amines

When you are considering the use of amines, remember that CARBIDE *supplies more than 60 other amines. For a complete list of these amines, ask for our new 1952 edition of "Physical Properties of Synthetic Organic Chemicals" (F-6136).*

NEW
AO
RESPIRATOR
LINE



Pay for ONE Facepiece, GET 7 TYPES OF PROTECTION with the AO R5000!

Yes, due to quick interchangeability of its threaded cartridges and disc type filter, the AO R5000 line of TWIN CARTRIDGE RESPIRATORS permits you to standardize on one respirator in protecting your workers against the multitude of dust, vapor and gas hazards commonly met with in industry. Remember, there's only one facepiece to stock and the R5000 offers greater visual area and many advanced construction features that mean added safety and comfort. Ask your nearest AO Safety Products Representative for the R5000. Tell him the respiratory hazards encountered in your operations and he will recommend the disc type filter and/or cartridges required.

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Retainer assembly accommodates both chemical cartridges and AO disc type filter — the small chemically treated filter that gives 40 times the dust protection of untreated filters. The cartridges screw in — assures a positive gas-tight seal. The felt filters stay put safely by a cover that screws onto retainer assembly.

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Dust Filter and Organic Vapor Cartridges, Combinations of both, and Metal Fume Cartridges Approved by the U. S. Bureau of Mines

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This 8' x 30' homogeneous lead-lined pressure vessel has recently been installed in one of the world's largest petroleum refineries.

Gunthard equipment and know-how was specified here to eliminate breakdowns and thus reduce costly shutdown time to a minimum.

The results show

SAVINGS IN MAN HOURS

SAVINGS IN OVERALL OPERATING COSTS

in excess of the original cost of the vessel.

The Gunthard organization has every facility for fabricating homogeneous lead-lined equipment—from 2 inch carbon steel fittings and all sizes of tanks and vessels, up to massive 90 foot towers. Skilled personnel fabricate equipment of every type from ferrous and non-ferrous metals including aluminum, stainless, stainless-clad and carbon steels.

We number among our regular customers many of the largest and most progressive chemical processing companies in the nation. If you have a problem that might be solved by expert metal fabrication—with or without lead lining or covering—write for complete information on how Gunthard engineering services and facilities can be of provable cost-cutting value to you.

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Maximum Capacity When Needed Most • Accurate Pressure Control Under Toughest Working Conditions • Trouble-Free Service • Smooth Operation • Tight Closure • Accurate Regulation • Speedier Production Results • Elimination of Failures • Constant Delivery Pressure • Cost Saving Operation • No Spoilage • Practically Zero in Maintenance Costs.

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"We first tried the STREAMLINED Valve about 6 years ago. We found it to shut off tight, hold the reduced pressure extremely constant and wipe out reducing valve troubles in more ways than one.

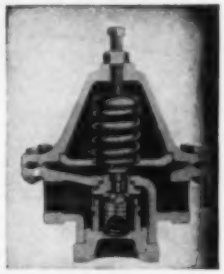
"Other makes of valves were constantly giving us trouble. They would never shut off tight, therefore our relief valves were blowing, which to us was discouraging.

"We have by this time several hundred of the STREAMLINED Valves throughout our plant on mostly processing work and we are well pleased. It is a must on our list."

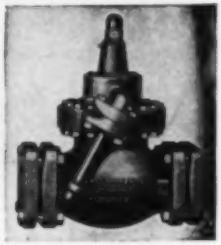
CASH STANDARD CONTROLS . . . VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS

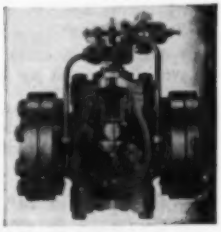
BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES
Send for them



Bulletin 950—features the CASH STANDARD Type D Single Seat Pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation



Bulletin 956—features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.



Bulletin 966—features the CASH STANDARD Self-Contained, Pilot Operated Type 10 Pressure Reducing and Regulating Valve for use with water or air; with any gas or oil that is non-corrosive; and with refrigerating fluids such as Ammonia and Freon. Many interesting particulars explained such as: how valve works, tight seating, large capacity, no waste, no water hammer or chatter.

Yours To Use

for any and all production problems involving SEPARATIONS OF SOLIDS FROM LIQUIDS

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THE UNBEATABLE COMBINATION AFLOAT*

A main condenser for MSTS Transport President Hayes in the shipyard of the New York Shipbuilding Corporation, Camden, N. J. Revere Cupro-Nickel Tubes (30% nickel) are used. The tube plates are Muntz Metal.

*AND WHEREVER ELSE CONDITIONS ARE EXTRA DIFFICULT

CUPRO-NICKEL is the preferred alloy for condenser tubes in marine use because of its superior resistance to the corrosive influences of sea and harbor water, the latter usually contaminated with extremely active industrial and sewage wastes. Thus it is natural that cupro-nickel, 30%, is being used for the tubes in three vessels now being completed by the New York Shipbuilding Corporation, Camden, N. J. These ships were originally ordered for the American President Lines, Ltd., for passenger and cargo service, but subsequently taken over for military service. The builder constructed the condensers at its yard, and Revere furnished the tubes and plates.

In addition to cupro-nickel, Revere also makes tubes and sheets in other alloys, such as Admiralty, Muntz Metal, Naval Brass, Aluminum Bronze, etc. Choice of the correct alloy depends on the conditions it must encounter. Revere will gladly collaborate with you on matters involving condensers and heat exchangers.

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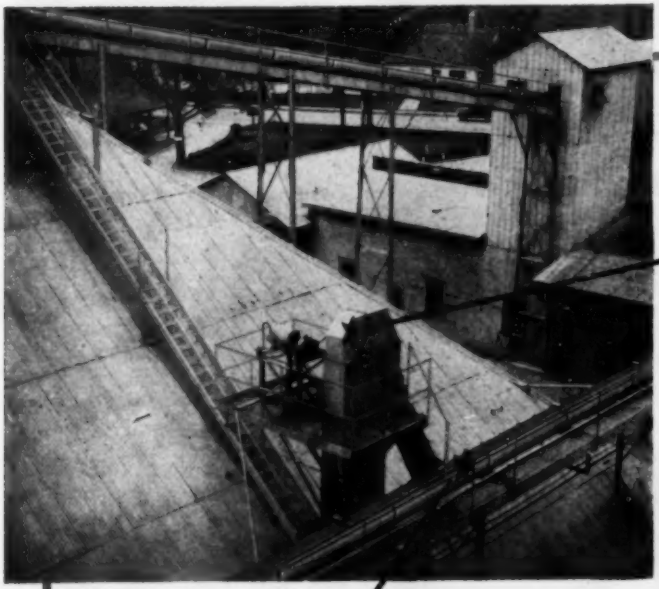

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Two Link-Belt Screw Conveyors and a Link-Belt Bucket Elevator move large volumes of cottonseed at an Illinois oil mill.

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Only with B. F. Goodrich grommet belts can you make these savings!

Save 3 ways! Investigate today! Write or mail coupon

You save belt costs because belts last longer, save production costs because machines keep running with fewer interruptions, save maintenance costs because they need less attention.

Patented grommet belts by B. F. Goodrich represent the only basic change since invention of the V belt. Belts last 20 to 50 per cent longer, depending on service. (The more severe the service, the greater the increase over ordinary belts.) Grommet belts have more rubber; they're more flexible, give better grip, less slip.

What is a grommet?

A grommet is like a giant cable except that it's *endless*—a cord loop built up by winding heavy cord on itself. There is no overlapping cord *section* as in all ordinary belts. Most belt failures occur in these sections where cords overlap!

All cords put to work

Each of the two grommets and every part of a grommet carry their share of the load. In ordinary belts under high tension the center cords "dish" because tension is greater near the driving faces. Dished cords are doing less work, not pulling their share. Grommet belts have no center cords, there is no dishing—therefore much more strength in proportion to cord volume—and less stretch. Grommet belts stretch, on an average, only about one-third as much as ordinary belts.

Better grip, less slip

Grommet belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

Send for proof

Send the coupon for a set of reports telling users' experiences and showing actual installations where grommet belts outlasted all others. Some typical cases:

"... within a few days ordinary belts had stretched ... After six months of 24-hour-a-day service BFG grommet belts haven't stretched at all ..."

"Ordinary belts lasted only 5 or 6 weeks ... B. F. Goodrich grommet belts are in their sixth month of service ..."

"Previous belts suffered from shock loads, wore out fast ... BFG grommet belts have been in service 2 years with no shut-downs..."

There are hundreds of cases like these.

They cost no more

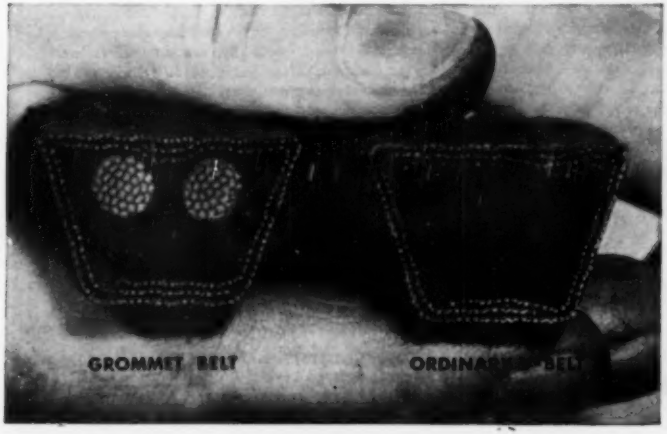
BFG grommet belts cost not one cent more than others. The savings they make for you are clear profit. They are made in C, D and E sections. They are patented by B. F. Goodrich. No other V belt is a grommet belt (U. S. Patent No. 2,233,294).

Write, send the coupon or see your B. F. Goodrich distributor. (He will show you his "X-ray" belt that shows the grommet construction clearly.)

Grommet V Belts BY

B.F.Goodrich

FIRST IN RUBBER



The B. F. Goodrich Company
Dept. CE-9
Akron, Ohio

☐ Send set of reports telling users' experiences and showing actual installations proving that B. F. Goodrich grommet belts outlast all others.

☐ Have distributor show me the "X-ray" belt that shows how B. F. Goodrich grommet belts are made.

Name_____

Firm Name_____

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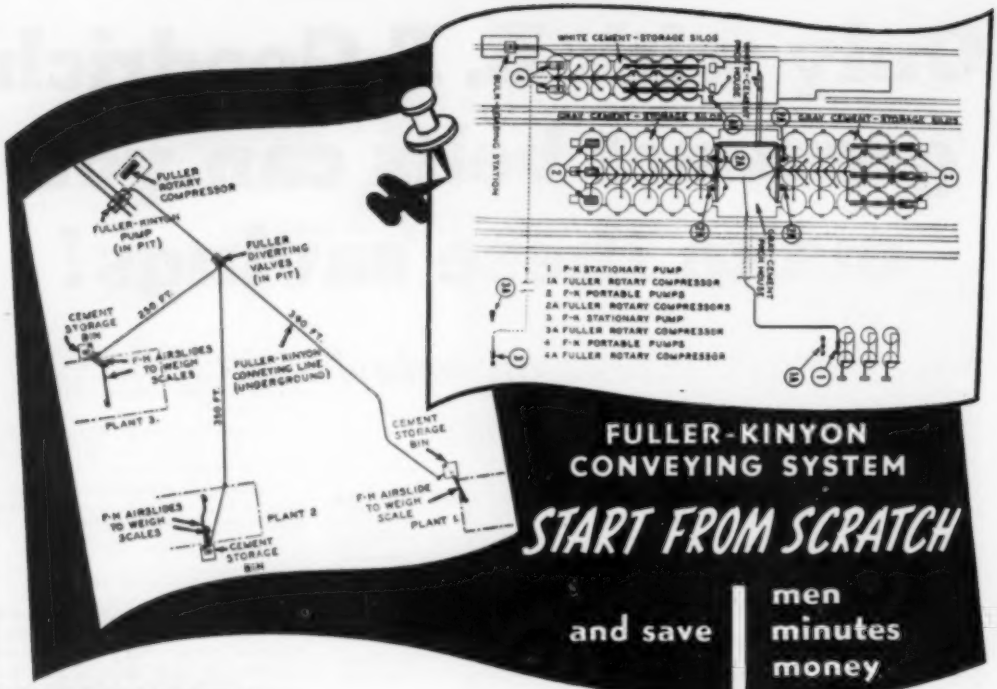
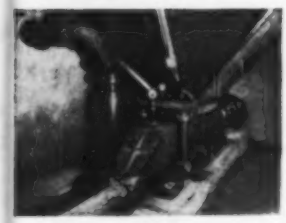


FULLER-KINYON CONVEYING SYSTEM

START FROM SCRATCH

and save | men minutes money



Fuller-Kinyon Stationary Pump conveying from bin.

Fuller-Kinyon Unloader unloading from box car.

The best way to solve any problems of conveying dry pulverized and granular materials is to "Start From Scratch". By that we mean, get all the facts on pneumatic conveying systems while you are still in the planning stage . . . either when building a new plant or modernizing an old one. Pneumatic conveyors permit economy and convenience in location of buildings and production equipment without the restrictions or straight-line limitations of mechanical conveyors. The layout of the conveying system can be designed to meet the specific requirements of the job, to conform exactly to local conditions, to insure minimum cost for erection, maintenance, and supervision.

Right there is where Fuller comes into the picture. As engineers and builders of four basic types of pneumatic conveying systems, Fuller is able to provide the exact system best suited to individual requirements.

Shown here is the Fuller-Kinyon System for conveying dry pulverized materials. It has many advantages: conveying pipe lines can be located anywhere—underground, suspended on simple hangers overhead, vertically, around corners, over long distances, and to practically any number of delivery points. There are no mechanical or explosion hazards. Conveying is clean, fast, and at minimum cost per ton of material handled.

We invite you to have Fuller Engineers make a complete survey and study of your plant plans—investigate local conditions and the material to be handled. Then they will make recommendations as to the system best adapted to your needs—enable you to save time, money, and material by having both plant and system built at the same time. To consult them places you under no obligation.

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P-130

Fuller

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Lasts longer in corrosive service

This quick-opening gate valve is one of a wide range of ALOYCO valves recommended for severe corrosive services. Its long life expectancy results from ALOYCO's:

A. metallurgical research devoted *exclusively* to corrosive applications;

B. foundry and machine shop facilities set up for high alloy valves *only;*

C. casting and machining practices dictated by the difficult characteristics of the alloys required for corrosive services.

Success Stories from ALOYCO's Corrosion Clinic

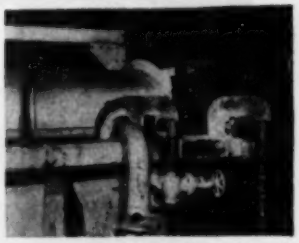
THE CORROSIVE: Concentrated sulfuric acid.

THE APPLICATION: Supply line to continuous cold sheet pickler.

THE PLACE: Largest steel mill on Eastern seaboard.

THE VALVES: Two ALOYCO 20 globe valves.

THE RESULTS: Former cast-iron valves gave trouble sticking and freezing, both open and shut, and required frequent replacement, losing production time. Original ALOYCO 20 valves have eliminated this difficulty entirely. Customer has replaced all cast-iron valves in this service with ALOYCO.



ALOYCO globe valve on sulfuric acid supply line to continuous sheet pickler.

THE BACKGROUND: When a customer can report "Best acid valve I've ever seen", that's good evidence that the special procedure ALOYCO uses in making corrosion-resistant valves pays off in lower valve costs and protected product purity.

ALOYCO *concentrates* on valves for corrosive services. We make no other types. Our foundry practices, our machines and our tools are designed for the production of high alloys alone.

And our *Aloyco Corrosion Clinic* specializes on problems of corrosion, contamination, discoloration, high and low temperature service.

If you have such problems in your plant, put them up to the *Aloyco Corrosion Clinic* for "diagnosis" and "treatment".

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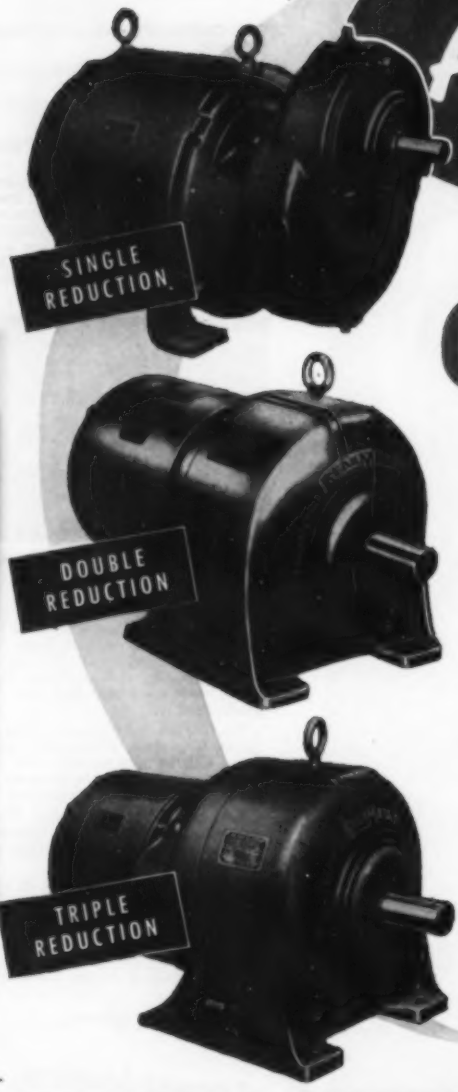
WITH

GEARMOTOR



. . . because it is available in single, double or triple reductions, offering a range of speeds: 780 through 7.5 r.p.m. Motor rating from 1 h.p. through 60 h.p.—A-c or D-c. The motors and gear units are each self-contained and readily separated . . . gears in multi-reduction units may be inspected, without uncoupling from driven machine.

These small, compact, self-contained units simplify the direct application of electric drive to individual machines.

GearMotoR conforms to the recommended standards of the American Gear Manufacturers Association and the National Electrical Manufacturers Association.

Send for 42-page illustrated catalog, containing full information and data necessary for ordering, and please use your Business Letterhead when requesting same.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

A Headline that is also a Helpline!

1 BUFLOVAK OFFERS PROFITABLE COOPERATIVE ASSISTANCE

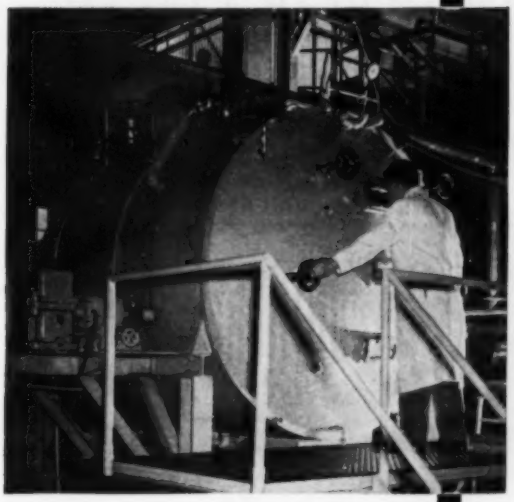
2 IN ITS RESEARCH AND TESTING LABORATORIES

3 . . . A PRE-TESTING SYSTEM THAT HAS SOLVED 6500 PROCESSING PROBLEMS

4 IN THE CHEMICAL, FOOD AND PHARMACEUTICAL FIELDS

●

Low-temperature drying for heat-sensitive products is performed on this sanitary type Stainless Steel Vacuum Double Drum Dryer installed in the BUFLOVAK Laboratory.



1 BUFLOVAK Research Laboratories and Testing Plant are maintained for your use . . . to help you solve problems in drying, evaporation, extraction, solvent recovery, crystallization, and food processing.

2 Completely equipped with pilot plant equipment for low-temperature evaporation and drying, and other advanced processes that lead to improved operations.

3 Here tests can be completed, ranging from a few beakers of precious material to tank-car quantities requiring round-the-clock operation on a production scale. Results are definite! Production data is accurate! BUFLOVAK'S pre-testing has given the right answer to more than 6500 processing problems!

4 Many new methods, highly profitable to their users, have been developed for use in the Chemical, Food and Pharmaceutical fields. Your investment in BUFLOVAK equipment can be safeguarded by pre-testing your product to prove at the start whether you are on the right track to profits.

Write for complete information.

BUFLOVAK BUILDS

EVAPORATORS
Low-Temperature
By-Product Recovery
Chemicals
Food Product
Crystallization

DRYERS
Vacuum Double Drum
Vacuum Rotary

Pilot Plant
Atmospheric

PROCESSING KETTLES
Mixers
Impregnators
Dopp Kettles

Solvent Recovery & Distillation Equipment

SEND FOR CATALOGS

Buflovak Equipment

DIVISION OF BLAW-KNOX CO.
1551 FILLMORE AVE., BUFFALO 11, N. Y.

Now serving your needs as

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

You've known these familiar trademarks...

COLUMBIA CHEMICALS

SOUTHERN ALKALI

NOW look for THIS TRADEMARK to assure the same high quality in alkalies and related chemicals . . .

A wholly-owned subsidiary of
PITTSBURGH PLATE GLASS COMPANY

You can rely

on the same experienced organization

Whether you've been accustomed to doing business in the past with Columbia Chemical Division of Pittsburgh Plate Glass Company, or with Southern Alkali Corporation, you'll continue to find the same competent personnel—in every department—welcoming the opportunity to serve you as Columbia-Southern . . .

THROUGH STRATEGICALLY LOCATED PLANTS AND OFFICES

Production at all plants is being maintained at the highest possible levels in order to help meet the current requirements of industry.

And the same district offices will continue to provide facilities that assure the most careful attention to the needs of your business.

COLUMBIA-SOUTHERN
CHEMICAL CORPORATION

Subsidiary of Pittsburgh Plate Glass Company

EXECUTIVE OFFICES: Fifth Avenue at Bellefield, Pittsburgh 13, Pa.

PLANTS: Barberton, Ohio · Bartlett, California · Corpus Christi, Texas · Lake Charles, Louisiana · Natrium, West Virginia

DISTRICT OFFICES: Boston · Charlotte · Chicago · Cincinnati · Cleveland · Dallas · Houston · Minneapolis · New Orleans · New York · Philadelphia · Pittsburgh · St. Louis

The Model CVM 3153 is the newest and smallest member of the complete Kinney Vacuum Pump family. Compare it with any other mechanical vacuum pump in its class for:

FREE AIR DISPLACEMENT (2 cu. ft. per min.)
POWER (¼ HP motor)
ULTIMATE LOW ABSOLUTE PRESSURE (0.1 micron or better)
SIZE (14⅜" x 10¾" x 13¼" high)
WEIGHT (only 70 lbs. complete)

Compare its quiet operation, its ease of starting, its sound construction . . . and you'll see why Model CVM 3153 is an important step forward in vacuum processing.

Wherever small size and big performance are required, put Kinney Model CVM 3153 to work. Use it in the laboratory. Use it in full scale processing installations, by itself or as a backing pump. Use it in permanent installations or as a portable unit for on-the-spot repair, service, or test work.

There's a Kinney Vacuum Pump for every service, from the big Single Stage 702 cu. ft. per min. Model 181420 to our "New Baby", Model 3153. KINNEY MANUFACTURING CO., 3551 Washington St., Boston 30, Mass. Representatives in New York, Chicago, Cleveland, Houston, New Orleans, Philadelphia, Los Angeles, San Francisco, Seattle.

Foreign Representatives: General Engineering Co. (Radcliffe) Ltd., Station Works, Bury Road, Radcliffe, Lancashire, England . . . Horrocks, Roxburgh Pty., Ltd., Melbourne, C. I. Australia . . . W. S. Thomas & Taylor Pty., Ltd., Johannesburg, Union of South Africa . . . Novelectric, Ltd., Zurich, Switzerland . . . C.I.R.E., Piazza Cavour 25, Rome, Italy.

Kinney VACUUM PUMPS

Write today for Bulletins V45 and V51-A

Thermofor Catalytic Cracking Unit for Socony-Vacuum Oil Company, Inc.

Whatever the type, size and location of your next refinery job, Bechtel resources and experience are available to design and build—*with your engineers,* or as a completely integrated service—

process design to operating plant.

BECHTEL CORPORATION

Los Angeles • **SAN FRANCISCO** • *New York*

"BUILDERS FOR INDUSTRY"

DESIGN • ENGINEERING • PROCUREMENT • CONSTRUCTION

FACTS about ETHYLENE and PROPYLENE OXIDE

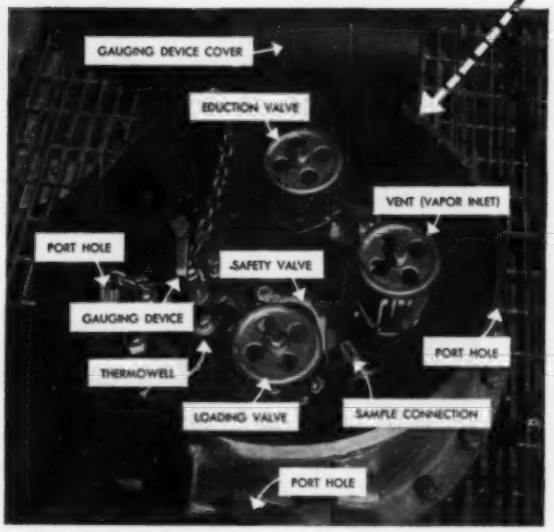
Today, more than ever, chemical materials should be used wisely and efficiently. The importance of Ethylene Oxide and Propylene Oxide to many industries has led Dow to believe that the following information may be of assistance in helping you realize greater value from these oxides.

Practically every major industry uses Ethylene Oxide or one of its many derivatives. Because Ethylene Oxide reacts with many other chemicals including fatty acids, phenols, alcohols and water, it is a basic component in many products. Ethylene Oxide is used in the manufacture of detergents . . . permanent antifreeze . . . cosmetics and bread conditioners. Propylene Oxide reacts with acids to form esters and with phenols to form phenoxy alcohols. In addition to the use of Propylene Oxide as an intermediate, it may be used as a low boiling solvent for cellulose acetate, nitrocellulose, vinyl resins, natural resins, hydrocarbons and as a sterilizing agent or product to inhibit the action of yeasts and molds.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

PROPERTIES

	Ethylene Oxide	Propylene Oxide
Molecular Weight	44.0	58.1
Boiling Point	51.3°F.	95.0°F.
Freezing Point	−168.2°F.	−169.6°F.
Flash Point (TAG Open Cup)	below −4.0°F.	below −21.0°F.
Fire Point (TAG Open Cup)	below −4.0°F.	below −21.0°F.
Specific Heat, Btu/(lb) (°F.)	0.44	0.47
Heat of Vaporization (1Atm), Btu/lb.	245.0	213.2
Specific Gravity	$0.896^{32°F.}$	$0.826^{68°F.}$
Refractive Index	$1.3614^{39.2°F.}$	$1.363^{77°F.}$
Explosive Limits (% Volume in Air)	2—100	2.1—21.5
Water Solubility, g/100g at 77°F.	∞	59
Alcohol Solubility	∞	∞
Ether Solubility	100	∞



Unloading Tank Cars of Ethylene Oxide or Propylene Oxide

1. The tank car should be accurately spotted on level track, the brakes applied, wheels blocked and appropriate caution signs displayed.
2. Attach approved ground connections to tank car before any contact is made with unloading equipment.
3. Attach inert gas line to vent valve of tank car and attach unloading line to eduction valve. Attach pressure gauge to loading valve. (These lines should be flexible steel with steel fittings. Wrenches and other tools used around Ethylene or Propylene Oxide should be made of nonsparking metals.)
4. Open loading valve to activate pressure gauge.
5. Open vent valve slowly and apply inert gas pressure to car to force Oxide into pump suction and to keep vapor phase of

This is one of a series of Dow advertisements you may wish to keep on file for reference and information. Write Dow for reprints.

Unloading Tank Cars (Cont'd)

tank car out of flammable range. A rotary pump is recommended for transfer of these materials.

6. When sufficient pressure has built up (about 35 psig) open eduction valve. This valve must be opened slowly so that excess flow check valve does not close.
7. Vent storage tank into which the Oxide is being pumped back into the tank car through the inert gas line. (The attachment of this vent line to the inert gas line must be made downstream from the compressor.)
8. When tank car has been unloaded, close valves and detach unloading lines. Care should be taken to allow no air to enter tank car. The car, containing principally inert gas, is then ready for return to Dow.

Handling Precautions:

Ethylene Oxide and Propylene Oxide are similar in many respects. Generally speaking, Ethylene Oxide is more reactive and more toxic than Propylene Oxide; however, the same general precautions should be applied to handling and working with both these chemicals.

Ethylene Oxide and Propylene Oxide are highly flammable and highly reactive. Every precaution should be taken in handling these materials to avoid any source of ignition. Explosion-proof motors and other electrical equipment including pumps, piping, storage tanks, and compressors should be well grounded.

No copper or copper base alloys or any other acetylide forming metals should be used in contact with Ethylene Oxide or Propylene Oxide. All equipment used should be free of acids, bases, salts and water since most of these act as poly-condensation catalysts. Oils, grease, dirt, air, sulfur, ammonia and hydrogen sulfide should also be excluded from contact with Ethylene Oxide and Propylene Oxide.

All new equipment or equipment which has been out of service should be thoroughly cleaned, dried and purged with an inert gas (i.e. Nitrogen or Methane) before being put into Ethylene Oxide or Propylene Oxide service. A blanket of inert gas should be kept on the Oxides to keep the vapor phase out of the flammable range.

Ordinary steel is acceptable for storage tanks and pipe lines. This equipment should be constructed to withstand an operating pressure of at least 50 psi. and should be insulated and provided with proper cooling equipment.

Toxicity:

Ethylene and Propylene Oxides should be considered hazardous chemicals in both their liquid and vapor forms. The prolonged single exposure to gas concentrations of but a few parts per million can have adverse effects, and regular daily exposure to low concentrations should be avoided. The principal toxic effect resulting from inhalation is thought to be an irritation of the lungs which may produce, after several hours, inflammation and tissue destruction leading to pneumonia.

The following symptoms should be taken as evidence of excessive exposure: irritation of the eyes, nose and throat, headache, nausea, vomiting and weakness.

For emergency protection a full face gas mask with canister for organic vapors, or an air supplied respirator are suitable.

In the event of exposure, the casualty should be immediately removed from further exposure and placed under medical care. If liquid Ethylene Oxide or Propylene Oxide is spilled upon the person, all contaminated clothing should be removed at once and the affected area washed for several minutes with running water. Prolonged contact with the skin can cause severe blistering.

It is recommended that anyone who may be subject to exposure to Ethylene Oxide or Propylene Oxide be equipped with face shield, rubber gloves and other protective clothing.

WRITE DOW FOR INFORMATION AND TECHNICAL ASSISTANCE.

The Dow Chemical Company, Dept. OC-26,
Midland, Michigan

☐ **Please send me additional information about Ethylene Oxide and Propylene Oxide.**

☐ **Please send_____ reprints of this advertisement.**

Name_____ **Title**_____

Company_____

Address_____

City_____ **State**_____

DOW

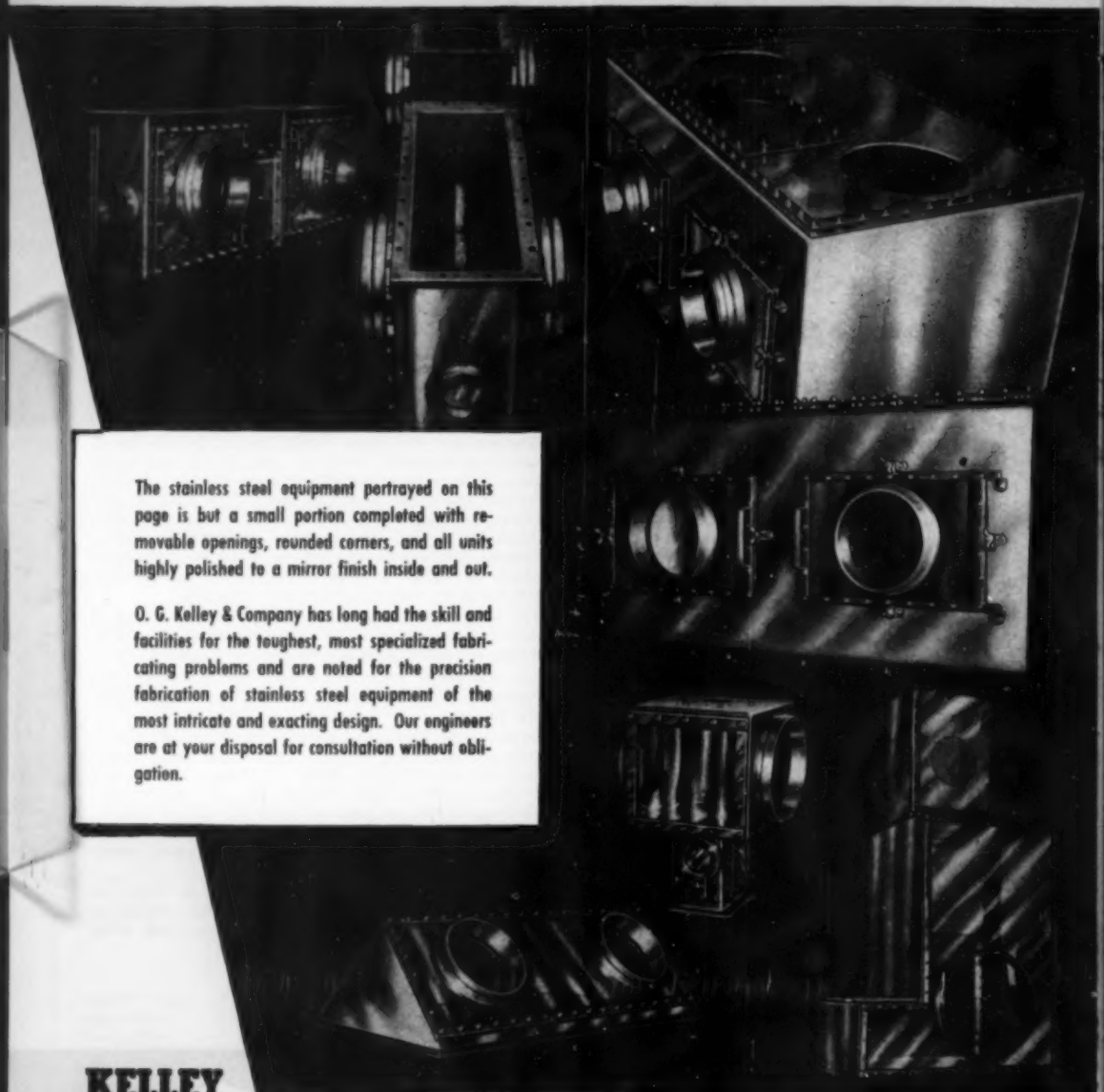
CHEMICALS

INDISPENSABLE TO INDUSTRY AND AGRICULTURE

KELLEY
STAINLESS STEEL

Stainless Steel Equipment

OF INTRICATE DESIGN and PRECISION FABRICATION



The stainless steel equipment portrayed on this page is but a small portion completed with removable openings, rounded corners, and all units highly polished to a mirror finish inside and out.

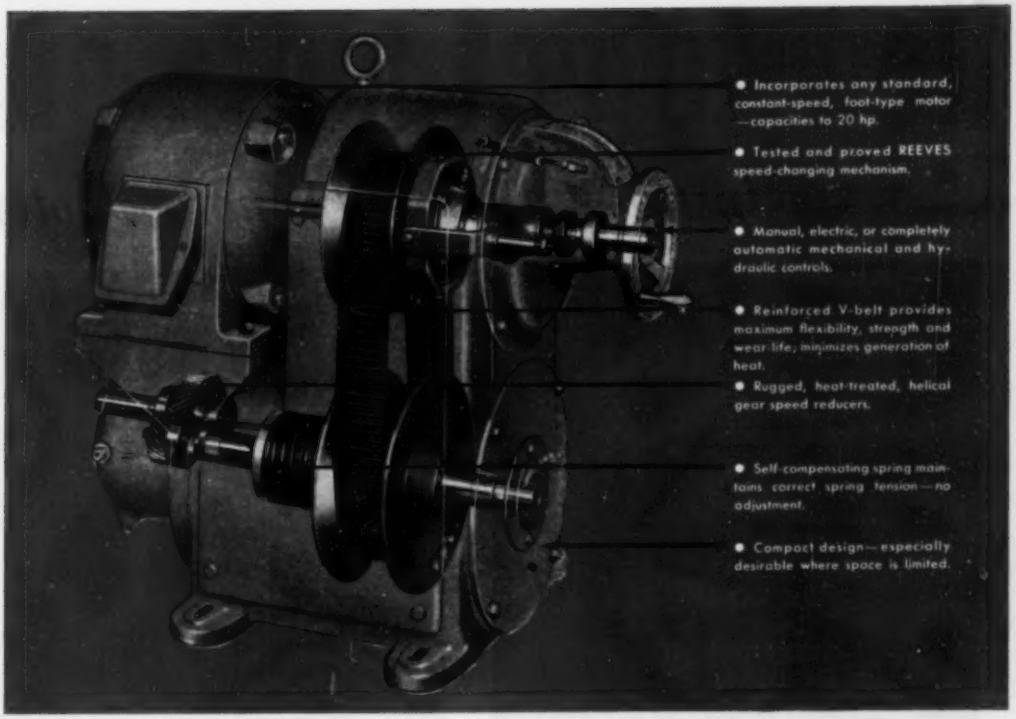
O. G. Kelley & Company has long had the skill and facilities for the toughest, most specialized fabricating problems and are noted for the precision fabrication of stainless steel equipment of the most intricate and exacting design. Our engineers are at your disposal for consultation without obligation.

KELLEY
STAINLESS STEEL
LEAD
WOOD · STEEL
Fabrication

O. G. KELLEY & CO.

96 TAYLOR STREET, BOSTON 22, MASS.

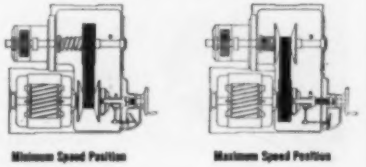
CLEVELAND, OHIO · NEW YORK, N.Y. · PITTSBURGH, PA.
JOHNSON CITY, TENN. · HOUSTON, TEXAS · ELIZABETH, N.J.


● Incorporates any standard, constant-speed, foot-type motor —capacities to 20 hp.
● Tested and proved REEVES speed-changing mechanism.
● Manual, electric, or completely automatic mechanical and hydraulic controls.
● Reinforced V-belt provides maximum flexibility, strength and wear-life; minimizes generation of heat.
● Rugged, heat-treated, helical gear speed reducers.
● Self-compensating spring maintains correct spring tension—no adjustment.
● Compact design—especially desirable where space is limited.

Everything's built in—

and built to give your machines trouble-free, stepless speed adjustability in the

REEVES Vari-Speed Motodrive®



REEVES Vari-Speed Motodrive utilizes proved REEVES operating principle of a V-belt driving between two pairs of cone-shaped discs which are adjustable to form an infinite number of driving and driven diameters. Discs are mounted on parallel shafts. One shaft receives power at constant speed from motor —other delivers power at infinitely adjustable speed to gear reducer from which desired speed is transmitted to driven machine.

Here's a complete variable speed power plant in one, space-saving unit . . . incorporating an operating principle proved in 300,000 installations . . . ruggedly constructed for years of trouble-free service. Without stopping the machine, a turn of the REEVES handwheel or touch of a button provides the correct speed for every operation . . . enables the machine to do *more* work and *better* work at lower cost. Available in vertical and horizontal designs; capacities to 20 hp; and speed ratios as great as 10 to 1. For the machines you are now operating and the new ones you plan to buy, obtain all the benefits of stepless speed adjustability by specifying modern REEVES Vari-Speed Motodrive. Send for free catalog No. CE67-G.

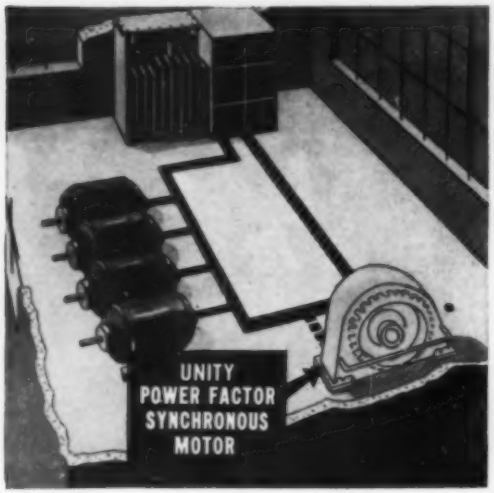
REEVES PULLEY COMPANY • COLUMBUS, INDIANA

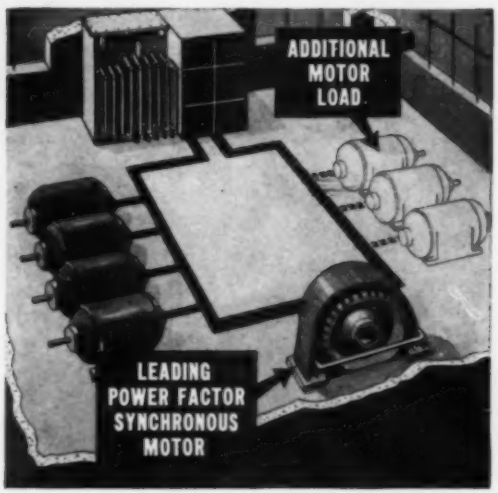
Recognized leader in the specialized field of variable speed control

accurate · variable
REEVES *Speed Control*

How to get more out

. . . . *install G-E Synchronous Motors*





If your plant power system is loaded close to full capacity and you have a place where a large constant-speed motor can be used, you may be able to install a *unity power-factor* synchronous motor without increasing the kva load on your system.

Or, if your power system is already overloaded, then a *leading power-factor* synchronous motor can actually supply kvars to your system while performing its usual drive duties. Then you can often install additional inductive apparatus to an existing system without fear of overloading feeder lines.

If you are planning plant expansion or you need more motors and/or suspect power system overloading, contact the nearest G-E sales engineer. He'll help you survey your system, and help you determine the type of synchronous motor you need—should this be one answer to your power system problems. *General Electric Company, Schenectady, N.Y.*

NEW! A Helpful Training Course on Motors!

Everyone concerned with technical training problems will want this new G-E Motor Selection and Application Course. Consists of 9 short, easily understood lessons. Complete kit—slide films, review booklets and instructor's manual—$100. Call or write your nearest G-E sales office, or send for free copy of 96-page instructor's manual.

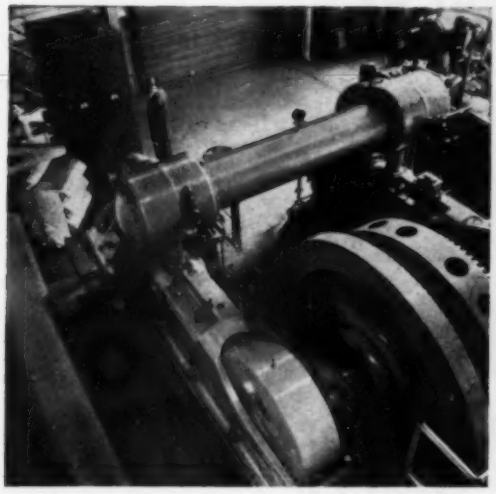
Look at the scope of this Course

1. Fundamentals of Motors
2. Types of Motors
3. Fundamentals of Selection
4. A-c Induction Motors
5. Single-phase Motors
6. D-c Motors
7. Synchronous Motors
8. Adjustable-speed Drives
9. Gear Motors

GENERAL ELECTRIC

# of your power system

for unity and leading power-factor drives



Control, too, will protect your system—G-E Limitamp high-voltage control provides ample interrupting capacity, protection for operating personnel, good appearance, and compactness. Here it controls and protects a 350-hp G-E synchronous motor.

G-E SYNCHRONOUS MOTORS ARE DRIVING . . . .

pumps
compressors
Jordans
beaters
crushers
ball mills
tube mills
large conveyors
blowers
saws
generators
rolling mills
pulp refiners
chippers
flour mills
stock refiners
line shafts
fans . . . .

in all types of industries where their efficiency, low first cost, and reliability make them exceedingly popular.

Check power factor on individual circuits—**easily, quickly—with new G-E hook-on power-factor meter. This portable instrument hooks around the line—no cutting of conductors, no costly shutdowns to make power checks. You can accurately locate those circuits where corrective action is needed**

General Electric Co. Sect. L 770-25
Schenectady 5, N. Y.

Please send me the following literature. . .

- ☐ **for reference purposes**
- ☐ **for planning an immediate project**

- ( ) **GER-234—Synchronous Motors Do Two Jobs at One Time**
- ( ) **GEA-5332—Low-speed Synchronous Motors**
- ( ) **GEA-5426—High-speed Synchronous Motors**
- ( ) **GEA-5469—G-E Testing Instruments**
- ( ) **GEZ-310—Motor Training Course Instructor's Manual**

Name .....

Company .....

Address .....

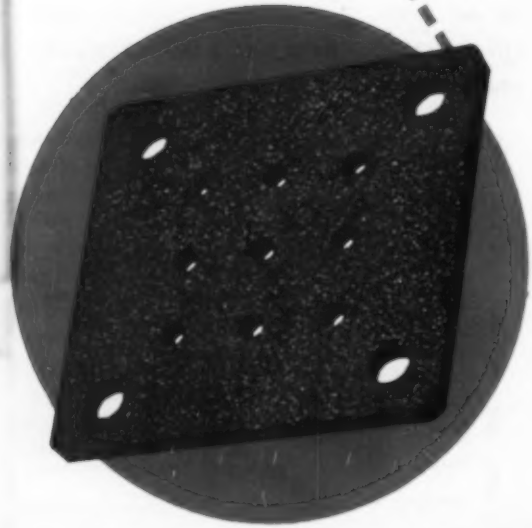
City ..... **State** .....

mail this coupon today

RELIANCE
Precision-Built
MOTORS

In making a better motor . . .

IT'S THE LITTLE THINGS THAT COUNT, too!



Here is one of the extras which proves that "All Motors are NOT Alike"—this synthetic rubber gasket . . .

1. Permanently indexes the motor leads
2. Prevents leads from rubbing against metal parts
3. Prevents water from entering motor at conduit box

For more evidence of the many ways in which Reliance Precision-Built Motors are made better to deliver dependable power longer . . . write for Bulletin B-2101.

RELIANCE ELECTRIC AND ENGINEERING CO.

1063 Ivanhoe Road, Cleveland 10, Ohio • Sales Representatives in Principal Cities

The Colonial Insulator Company, Akron, Ohio, has been successfully manufacturing quality porcelain products since 1894. Which means they're in a position to recognize a good thing in the ceramics field when they see it. They saw it in ALCOA Alumina.

After extensive experimental work, Colonial recently began producing porcelain bodies containing approximately 15% ALCOA Calcined Alumina. The results were even better than expected. ALCOA Alumina not only lowered the coefficient of expansion and reduced thermal deformation, but increased resistance to abrasion, thermal and mechanical shock. Colonial porcelains are now stronger, whiter, more impervious and dielectrically superior to the old product—because of ALCOA Alumina.

High-Voltage Insulator

BUILDING BETTER BODIES WITH ALCOA ALUMINA

Dipping Form—Rubber Glove

Betatron Tube

All over the country, *successful* ceramic manufacturers are doing great things with ALCOA Alumina. Whether they make abrasives or glazes, refractory bricks or glass, they know that by adding this uniformly pure aluminum oxide to their mixes, they make their products *better*.

For the qualities you want most in your ceramics, rely on ALCOA Alumina. It can make any ceramic product —*your product*—the best of its kind. We'll gladly tell you how. Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 602J Gulf Building, Pittsburgh 19, Pennsylvania.

Alcoa Chemicals

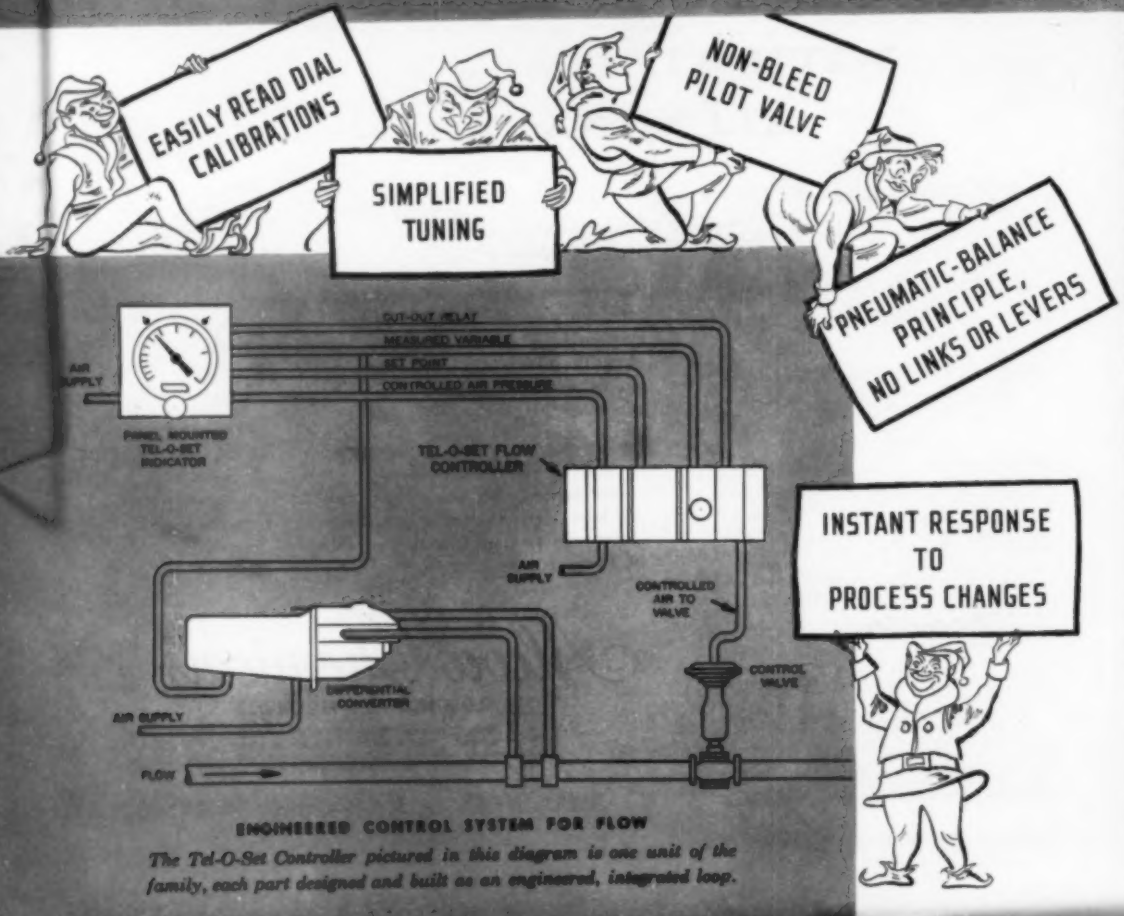
ALCOA **ALUMINAS and FLUORIDES**

ACTIVATED ALUMINAS • CALCINED ALUMINAS • HYDRATED ALUMINAS • TABULAR ALUMINAS • LOW SODA ALUMINAS ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE • GALLIUM

Important Contribution

Introducing..

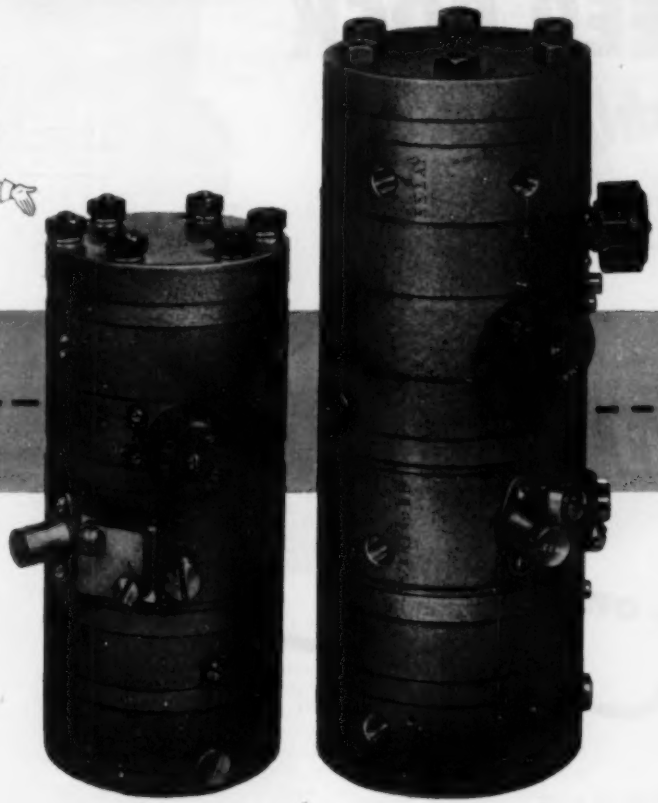
The New TEL-O-SET CONTROLLERS



ENGINEERED CONTROL SYSTEM FOR FLOW

The Tel-O-Set Controller pictured in this diagram is one unit of the family, each part designed and built as an engineered, integrated loop.

to Process Control



- **FOR ALL CONTROL APPLICATIONS—**
  Flow, temperature, pressure level and other process variables.
- **FOR GREATEST ECONOMY IN APPLICATION—**
  Three control forms available.
- **FOR OPTIMUM FLEXIBILITY—**
  Universal bracket for control room, valve yoke or structure mounting.
- **FOR EASY MAINTENANCE—**
  Coded, interchangeable sections. Split manifold permits removal of controller while on manual by-pass.

For detailed information, write for a copy of Specification Sheet No. 768 . . . and call in our local engineering representative for a discussion of your process needs.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division,* Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
Brown Instruments

DEEP ROCK
ships safely

Just as good oil gives dependable protection from wear in engines, Tri-Sure Closures* give perfect security from leakage, pilferage and contamination in drums.

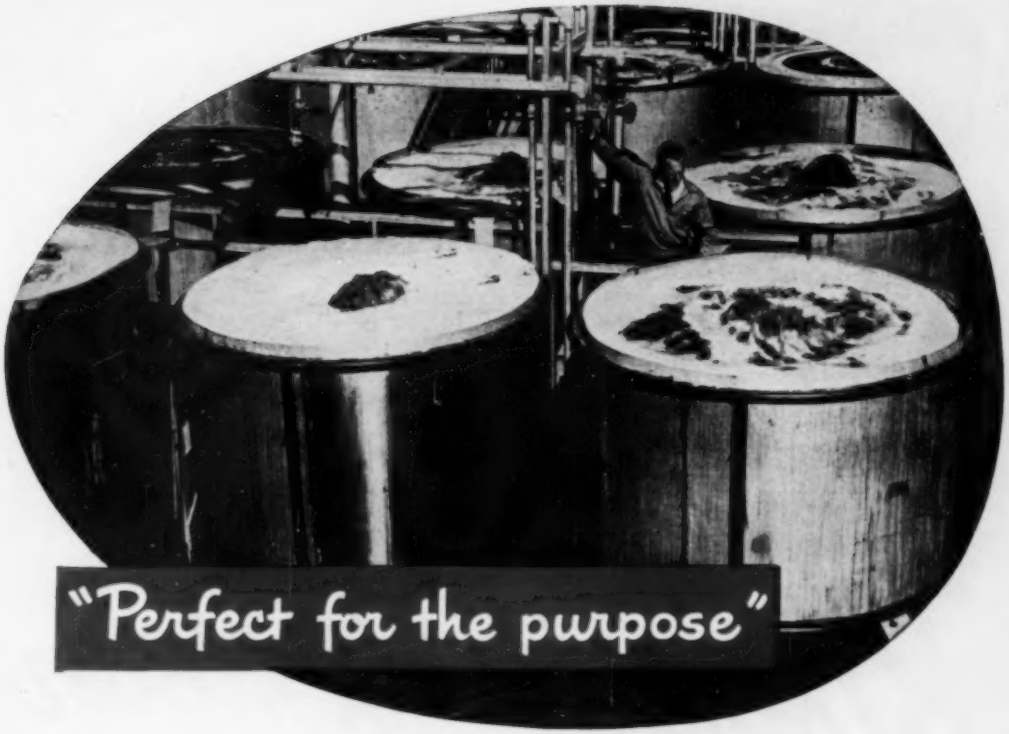
That is why the Deep Rock Oil Corporation seals *every drum* of *every brand*—Heavy Duty, Air Race Premium, and Prize—with Tri-Sure Closures.

Deep Rock has been a Tri-Sure user for over 15 years. And every year has confirmed their confidence in the Tri-Sure *Flange*, *Plug* and *Seal* as the best protection—for the best products.

Safeguard your product—wherever it is shipped or stored—by specifying "Tri-Sure Closures" on every drum order.

*The "Tri-Sure" Trademark is a mark of reliability backed by 29 years serving industry. It tells your customers that genuine Tri-Sure Flanges (inserted with genuine Tri-Sure dies), Plugs and Seals have been used.

AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA



● For processing ripe and green olives, the Pacific Olive Company needed a tank material that is completely sanitary and easy to keep clean. This material must not corrode or otherwise deteriorate under exposure to salt, alkalies, lactic acid, tannin, and outdoor atmospheres. Tanks must be light in their supports, yet tough and rigid. They must look bright and neat year after year without painting.

Mighty tough specifications for any material, yet ENDURO Stainless Steel meets them all perfectly . . . and throws in long life for good measure. So satisfactory was the performance of the first tank that eight more immediately were ordered, then 31 and finally 20 more for a total of 60! A company spokesman sums it up by saying, "stainless steel is perfect for our purpose . . . it is the only possible material which can fill all our requirements."

Do your own equipment requirements parallel these? Then ENDURO Stainless and Heat-Resisting Steels could be perfect for your purpose, too. Republic technical and metallurgical staffs will help you use the many available analyses profitably. Just write:

REPUBLIC STEEL CORPORATION

Alloy Steel Division • Massillon, Ohio

GENERAL OFFICES • CLEVELAND 1, OHIO

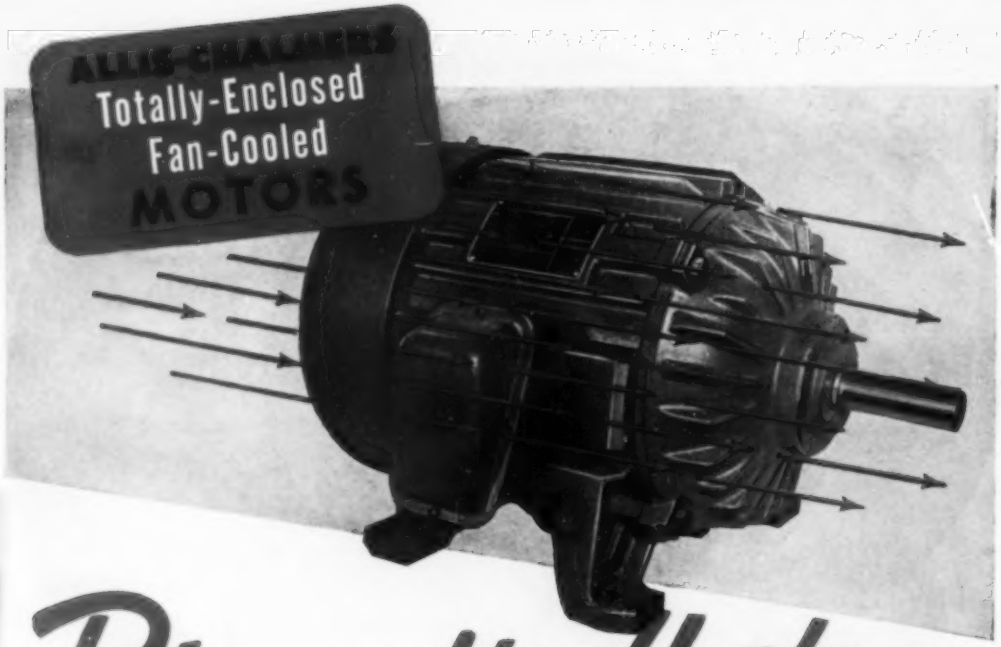
Export Department: Chrysler Building, New York 17, N. Y.

Republic

REPUBLIC STEEL

ENDURO STAINLESS STEEL

Other Republic Products Include Carbon and Alloy Steels—Pipe, Sheets, Bolts and Nuts, Tin Plate, Tubing, Niles Barrels and Drums



Blows itself clean as a Whistle!

DIRT IS CARRIED AWAY by cooling air blown over the ribbed cast iron frame and bearing housings of this new Allis-Chalmers tefc motor. That means less motor cleaning . . . inspection . . . overhaul!

Concealed air passages and pockets have been eliminated. Dirt can't build up to cause overheating. And as for oily dirt that sticks — just wipe or blow it off.

Studies show that on most applications, totally-enclosed fan-cooled motors more than pay back their extra cost in reduced maintenance. And this new Allis-Chalmers Type APZ tefc motor makes maintenance costs lower than ever before.

Rigid Construction

The frame is cast iron which has high resistance against corrosion and distortion. Bearings are pre-lubricated at the factory and should need no attention for years. Tapped holes with pipe plugs to permit regreasing and to provide grease relief are standard equipment.

Get All The Facts

The new Allis-Chalmers Type APZ totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224* to 505. Also in explosion-proof type. Your A-C Authorized Distributor or District Office has complete information. Call today, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225. A-3427

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS

*Similar design non-ventilated motors Type APK, also available in frames 203 to 224 inclusive.

NON-STICKING ★ NON-LEAKING ★ QUICK OPERATING

Tank controls *have* to be safe! Leaks must not occur. Quick operation is essential to switch from tank to tank and line to line. Only Nordstroms offer assurance of perfect performance, regardless of line fluid.

KEEP UPKEEP DOWN!

Nordstrom VALVES

–NOW AUTOMATICALLY LUBRICATED WITH Trade Mark Hypermatic Pats. Applied for

MULTIPLE ORIFICE METER HEADER

There's a NORDSTROM VALVE for every service

HYPRESEAL
Main Line Type

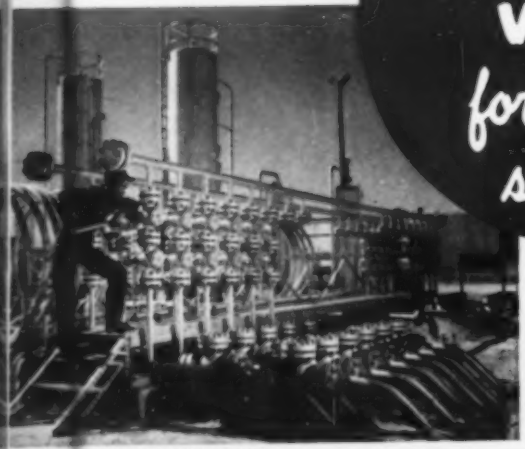
HYPRESEAL
Medium Pressure Type

STANDARD
Venturi Type

STANDARD
Screwed Gland Type

TWO-BOLT
General Service Type

SERVICE COCK
Lubricated



OIL COUNTRY FIELD PLANT

GAS DEHYDRATION UNIT

STATION MASTER CUT-OFF VALVE
—AUTOMATIC POWER OR MANUAL CONTROL

Nordstrom Valves

KEEP UPKEEP DOWN

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400 North Lexington Avenue, Pittsburgh 8, Pa.

Atlanta, Boston, Chicago, Columbus, Houston, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco, Seattle, Tulsa . . . and leading Supply Houses. Export: International Division, Rockwell Manufacturing Company, 7701 Empire State Building, New York 1, N. Y.

Not, PLEASE, In the Name of Fairness

Our national Office of Economic Stabilization has adopted a policy of gearing wages to the cost of living. We are told that "escalator clauses," which provide that rates of pay shall be adjusted to take account of changes in the cost of living, will be generally approved.

If the adoption of this policy had been announced as a frank concession to political expediency, it would have been quite understandable. There may very well be votes, lots of them, in a policy which purports to protect the income of a large group against loss through the price inflation caused by the defense program.

A case might even have been made for a policy of approving escalator clauses on grounds of production expediency. The leaders of some three million organized workers now covered by such clauses have indicated that they would fight to the limit to keep them and thus maintain "real wages," that is, wages measured by their purchasing power. The leaders of other organized groups have indicated they would fight to get the benefit of such clauses. Denial of them might mean serious strikes.

Justified "in Fairness"

However, the policy of approving escalator clauses was not based on these relatively low grounds of expediency. It was justified on high moral grounds, on grounds of "fairness." In the words of the President's Council of Economic Advisers, "maintenance of real wages during inflation cannot in fairness be disallowed."

That proposition is false.

It would be truthful to say, "maintenance of real wages during inflation cannot in fairness be allowed."

The truth of the corrected proposition becomes evident immediately when you take a look at the basic nature of the inflationary problem created by defense mobilization.

We are devoting a large share of our national production to defense. The share is now scheduled to hit about 20% in 1952.

Since we are not able to increase our total production fast enough to meet defense needs

in addition to civilian needs, that means a cut in the supply of goods and services that is available for civilian consumption. But the money paid out for the production of defense materials is added to that which is available to buy civilian goods.

Thus, more money is put into the hands of the people to buy less goods. So prices go up. That is inflation.

If one group of people then is granted enough additional money to offset the price increases — and that is the purpose of an escalator clause — and thus can continue to buy as much as they have been buying right along, less goods will be left for other consumers who are not getting this advantage. That is palpably an unfair distribution of the sacrifices necessitated by defense mobilization. In fairness, therefore, maintenance of real wages in inflation cannot be allowed.

Organized workers were not the first, of course, to get the benefit of an automatic adjustment to take account of the increased cost of living. The farmers got theirs first. The price parity formula is, in essence, an escalator clause. The federal government underwrites increases in the prices of the things farmers sell in order to match increases in the prices of the things they buy.

Crucifying the Helpless

As matters stand, two groups are without benefit of escalator clauses. One group is composed of manufacturing firms. While they have not been nearly as successful as the misleading reports of "record-breaking profits" suggest, they have been able to look after themselves fairly well — thus far.

But one group is completely without protection. It is that numerically large but politically unorganized mass of people — many of them old and relatively helpless — who are trying to live on pensions, annuities and other fixed incomes derived from their savings. They are at the end of the line when the increased costs of inflation are passed along. They have no one to whom they can pass the buck. They are being progressively pauperized by the continuing inflation caused by progressive boosting of costs and hence prices.

With the present line-up of pressure groups in Washington, protection for the principal victims of inflation — those who have saved for a rainy day only to find inflation has blown away the roof — is obviously an extremely difficult business. But to have even temporary insulation against inflation granted to powerful groups in the name of fairness should be offensive to the nostrils of a nation that presumes to assert the moral leadership of the Western World.

The only really fair way to handle inflation is to prevent it. But once it is under way, fairness demands that the burdens be as evenly distributed as practicable.

An escalator clause — or a farm parity provision — is explicitly a device to enable the group favored by it to escape the burden of inflation. Whatever concessions we feel we must make to political pressures or production expediency, let us at least be honest enough not to invoke "fairness" as justification for so arbitrary a discrimination in the distribution of the defense burden.

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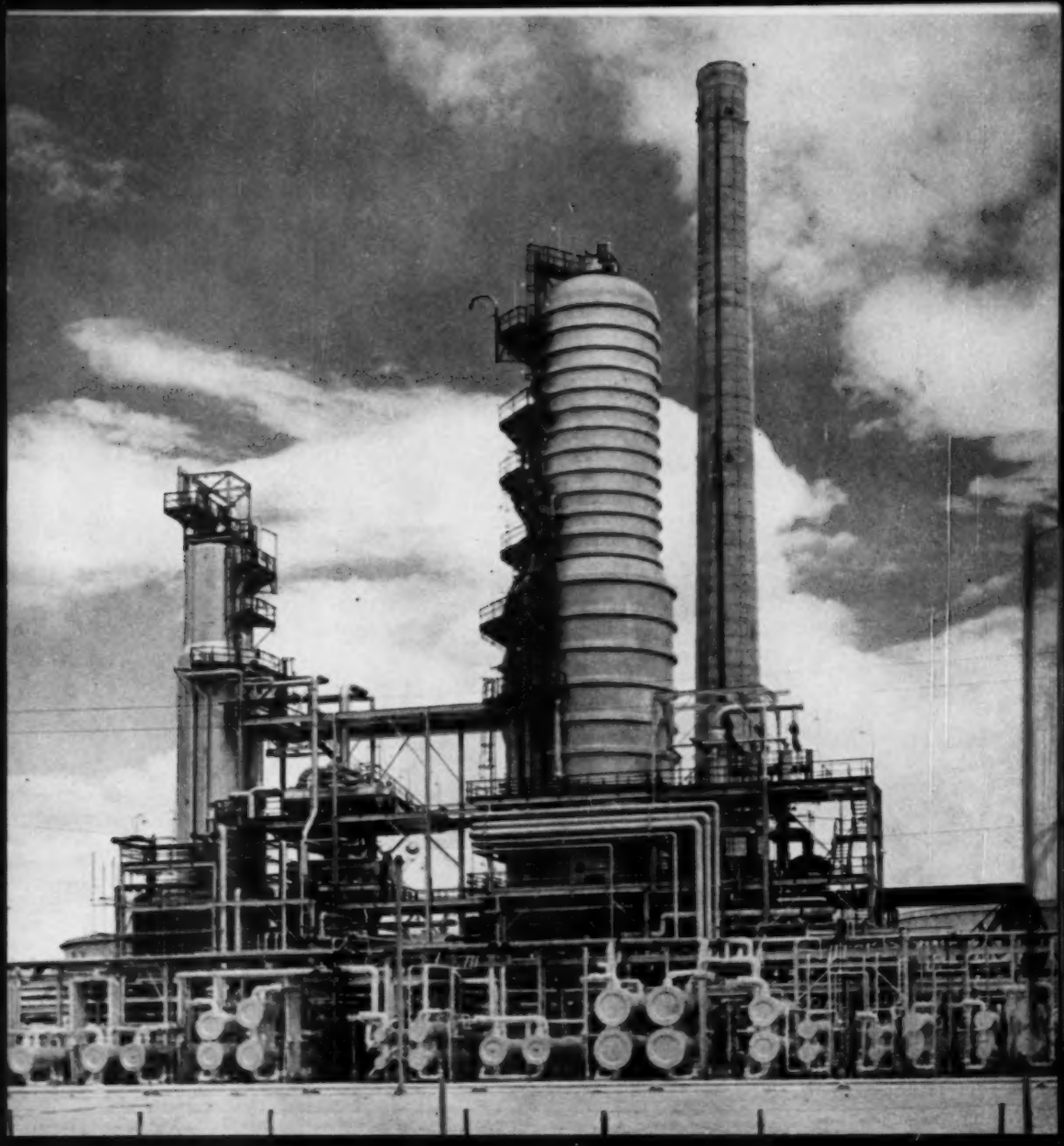


"On Stream" at Fawley

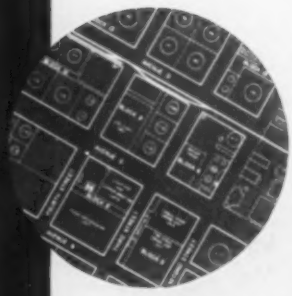
This 60,000 barrel per day two-stage crude distillation unit and the 66,000 barrel per day single-stage crude unit are "on stream" at the new refinery of the Esso Petroleum Company, Limited at Fawley, England. . . . They are but two of 14 process units being built at this new refinery—the largest in Europe—by Foster Wheeler, the over-all contractor on the entire refinery project.

FOSTER WHEELER CORPORATION

165 BROADWAY, NEW YORK 6, NEW YORK

one contract

one contractor



From plot plan to complete refinery, a Foster Wheeler contract provides experienced engineering service for every detailed step in the sequence of design, procurement, fabrication and construction.

...more than **500** process units have been designed and constructed by Foster Wheeler in over 30 years service to the petroleum and chemical industries.

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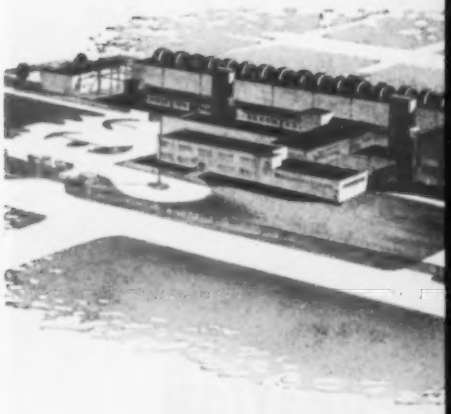
this plant builds Sodium Bricks for industry

At this centrally-located plant in Ashtabula, Ohio, National Distillers Chemical Corporation manufactures Metallic Sodium — a vital building block for the chemical industry.

Some of the country's most important chemical products — fatty alcohols, sodium cyanide, sodium peroxide, dyestuffs, pharmaceuticals, tetraethyl-lead and many others — are built on this versatile element.

National Distillers Chemical Corporation is pioneering new developments in the field of sodium chemistry which are rapidly expanding this list of products. Inquiries concerning the possible application of Sodium in your products and processes will be welcomed. Address the Technical Sales Department, State Road, Ashtabula, Ohio.



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No. automatic. No complicated control problems.

Generated at point of use with equipment requiring little space.

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Constant, predictable operating cost.

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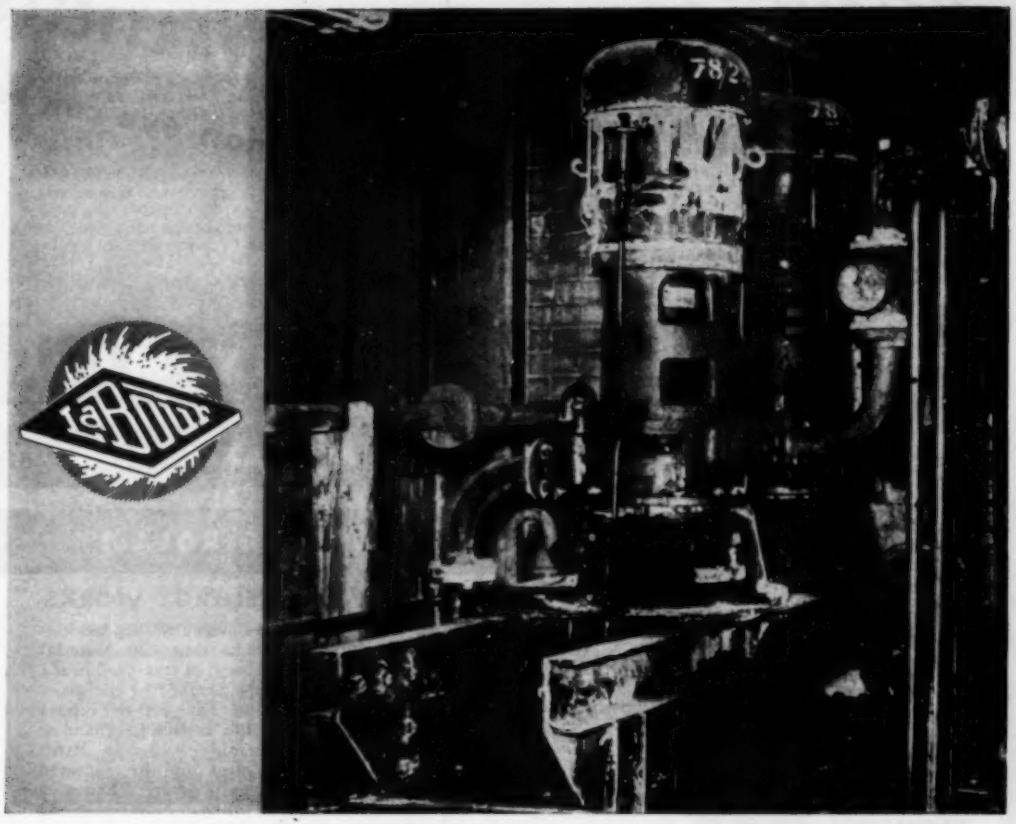
Pioneers in Continuing Ozone Research



Universal Answer to Tough Jobs

For more than two years now, the LaBour Type G pumps pictured here have been on continuous 24 hour service handling 96% sulphuric acid at 65° C. They are operated in London, England, by that city's largest maker of sulphuric acid. These particular pumps were built in the British LaBour plant, under the same strict supervision and test policy followed in the U. S. LaBour operations.

All over the world, wherever chemical processes place severe service demands on pump equipment, experienced engineers prefer LaBour. With well over a quarter century of history now on record, LaBour pumps have universally demonstrated themselves as the best possible insurance against costly interruptions due to pump failure. If you are interested in true operating economy based on twenty-eight years of proof, ask us about LaBour pumps for your next job.

ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

LABOUR

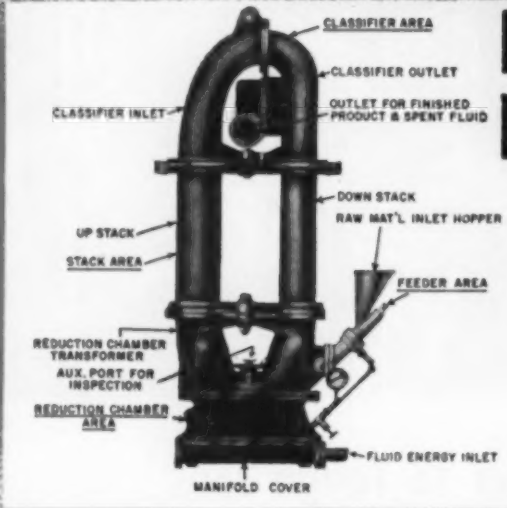
THE LABOUR COMPANY, INC. ★ Elkhart, Indiana, U.S.A.

C.H. Wheeler

"MOTIONLESS" MILL GRINDS PARTICLES

as low as 100 times finer than the human eye can see

FLUID ENERGY MILL



NOW AVAILABLE WITHOUT

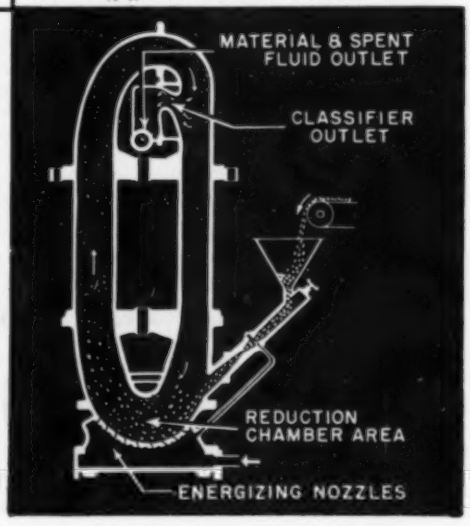
LEASE OR ROYALTY

HOW FLUID ENERGY WORKS

The Wheeler Fine Particle Mill is motionless in that it has no moving parts. Material at approximately 4 mesh or less is fed in at a controlled rate and entrained by energized fluid (air, steam or any gas or vapor) traveling around the reduction chamber at sonic or supersonic velocities. Particles break themselves up by repeated shattering against each other. When they reach desired size (micron or sub-micron) they escape with spent fluid through the classifier outlet into collectors of Wheeler design. Centrifugal force keeps the coarser particles toward the outside of the circuit until they grind each other down.

FEATURES OF THE C. H. WHEELER FINE PARTICLE MILL

1. No moving parts. No rapid wear.
2. Continuous reduction for continuous processing.
3. Micron particle sizes far below the limits of the finest mesh of mechanical methods—as low as ½ micron average particle size.
4. Lower cost per ton over mechanical grinding in sizes below 44 microns.
5. Ideal grinding "climate" possible by controlling temperature, velocity, humidity, and type of fluid medium.



C. H. Wheeler Manufacturing Co., 1808 Sedgley Ave.,

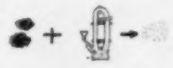
Cooling Towers—Vacuum Refrigeration—High Vacuum Equipment—Micro-Particle Reduction Mills

HAS MANY USES IN CONJUNCTION WITH GRINDING

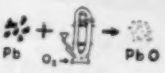
DRYING: Use of air or superheated steam as the fluid medium removes moisture from the product, combines particle reduction with drying.

COATING: By controlling "climate" and feed rate, sprayed coating or dust coating of fine particles can be accomplished during the process of reduction.

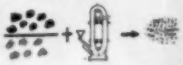
BREAKING UP AGGLOMERATES: Small particles which are grouped in agglomerates can be dispersed economically.



CHEMICAL REACTIONS: By controlling "climate" and conditions of feed, chemical changes can be effected and regulated.



BLENDING OR MIXING: Blending and mixing of ingredients for a wide variety of products can be combined with the process of reduction.



SIZE CLASSIFICATION: Automatic size classification is an inherent feature of the mill design. It is further augmented by the unique primary and secondary collectors.

NEW SUB-MICRON RANGES FOR YOUR GRINDING PROCESS MAY IMPROVE YOUR PRODUCT SEVERAL WAYS

FINER TEXTURE. Surfaces of particles become smooth and uniform.

MORE UNIFORM AND NARROWER DISTRIBUTION RANGE. By close control of particle size.

ENDURING SUSPENSION. With finer, more uniform particles the settling rate in suspension is decelerated.

A PURE PRODUCT. Mill wear with its contamination of the product is practically eliminated.

FASTER REACTION. The finer the particle the greater the surface area exposed to combustion, absorption, or any other chemical reaction.

MORE UNIFORM COLOR. Finer particles disperse more uniformly in a vehicle resulting in more uniform color—enhances the appeal of many products.

EXACT COLOR MATCHING. Through control of feed materials and operating conditions uniformity found in one period may be duplicated at any other time.

Total Surface Area of a 50 Mesh Particle when reduced to 4 Micron Particles
Comparative Surface Area 50 Mesh Particle Reduced to 4 Micron Particles
3 A.M.
6 A.M.
9 A.M.
12 NOON
3 P.M.
6 P.M.

ARE YOUR MATERIALS LISTED HERE?

A partial list of materials reduced to micron fineness in the C. H. Wheeler pilot plant.

- Alumina
- Barytes
- Ceramics
- Clays
- Corundum
- Coals
- DDT and DDT Mixtures
- Diatomaceous Earth
- Earthen Pigments
- Face Powders
- Feldspar
- Foods
- Graphite
- Gypsum
- Insecticides
- Iron Oxide
- Irons—Sponge and Electrolytic
- Lead and Lead Oxides
- Limestone
- Magnesium Silicate
- Metals
- Mica
- Pharmaceuticals
- Pigments
- Resins
- Silicon Carbide
- Sulphur and Sulphur Compounds
- Talcs
- Titanium Dioxide
- Waxes
- Whiting
- Zirconium Silicate

OUR PILOT PLANT RUNS SIZEABLE SAMPLES

The above are just a few of a 1000 tests. We will run a sizeable sample for you at moderate cost for set-up and operating time.

INQUIRIES SHOULD BE ON YOUR COMPANY LETTERHEAD . . . OR WIRE OR PHONE.

C. H. Wheeler OF PHILADELPHIA

Philadelphia 32, Pa. • Representatives in Most Principal Cities

— Steam Condensers — Steam Jet Ejectors — Marine Condensers & Ejectors — Deck Machinery

NEW

Specially Designed for Processing Operations

★ Choice of Materials
★ Oil Lubricated Bearings
★ Temperatures to 500° F.
★ Sizes to 1200 GPM, 250 Ft Head
★ Stuffing Box or Mechanical Seal

LONG LIFE, high efficiency, easy maintenance; you get them all from this new Allis-Chalmers Chemical Pump. A wide choice of materials plus application engineering by men who know how to select the right material for your job means longest possible parts life and low maintenance costs no matter what you pump.

There is plenty of room between pump and pedestal for easy maintenance but rigidity has not been sacrificed. Maximum interchangeability of parts between sizes keeps parts inventory low.

ONE DEPENDABLE SOURCE

Allis-Chalmers can supply you with a complete pumping unit—pump, motor, drive and control — all of coordinated design and manufacture and all mounted on a rigid base ready to install.

To get more information on this new Allis-Chalmers Chemical Pump, call your Allis-Chalmers Authorized Distributor or District Office. Or write to Allis-Chalmers, Milwaukee 1, Wis. for Bulletin 52B7638.

A-3405

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

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by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

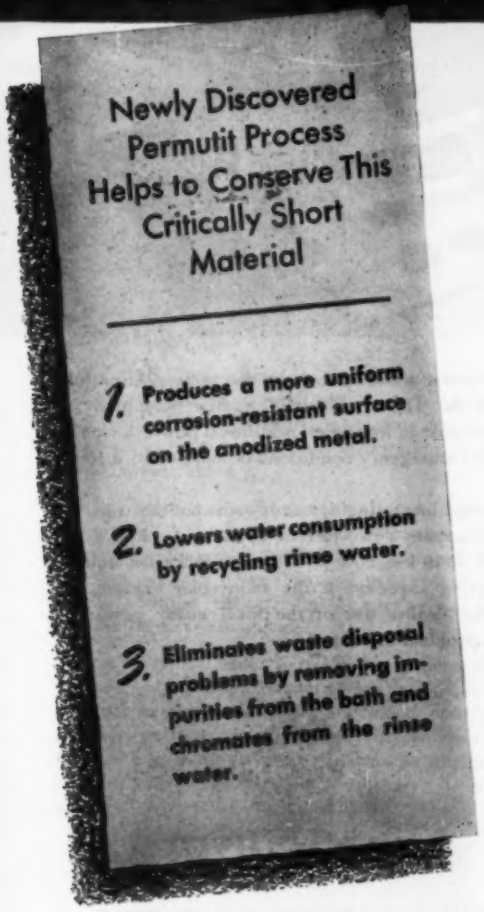
CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

ALLIS-CHALMERS

SAVE 90% OF CHROMIC ACID

Used in Anodizing


Newly Discovered Permutit Process Helps to Conserve This Critically Short Material
1. Produces a more uniform corrosion-resistant surface on the anodized metal.
2. Lowers water consumption by recycling rinse water.
3. Eliminates waste disposal problems by removing impurities from the bath and chromates from the rinse water.

CHROMIC acid anodizing of aluminum used to be an expensive operation, because it wasted valuable acid. Now you can prevent this expensive waste with the NEW Permutit process for chromic acid recovery.

First, a Permutit Q cation exchanger removes contaminating metallic cations which would otherwise consume chromic acid in the bath solution. The chromic acid content remains uniform throughout. Regeneration of the Permutit Q is with cheap sulfuric acid.

The Permutit S anion exchanger removes all chromates from the rinse water. *No water containing chromates is sent to waste.* All chromates are returned to the anodizing bath.

In these days of high costs and critical shortages, the value of the recovered chromic acid will more than pay for the operation of this new Permutit process. The process is equally applicable to other metal working processes consuming chromic acid.

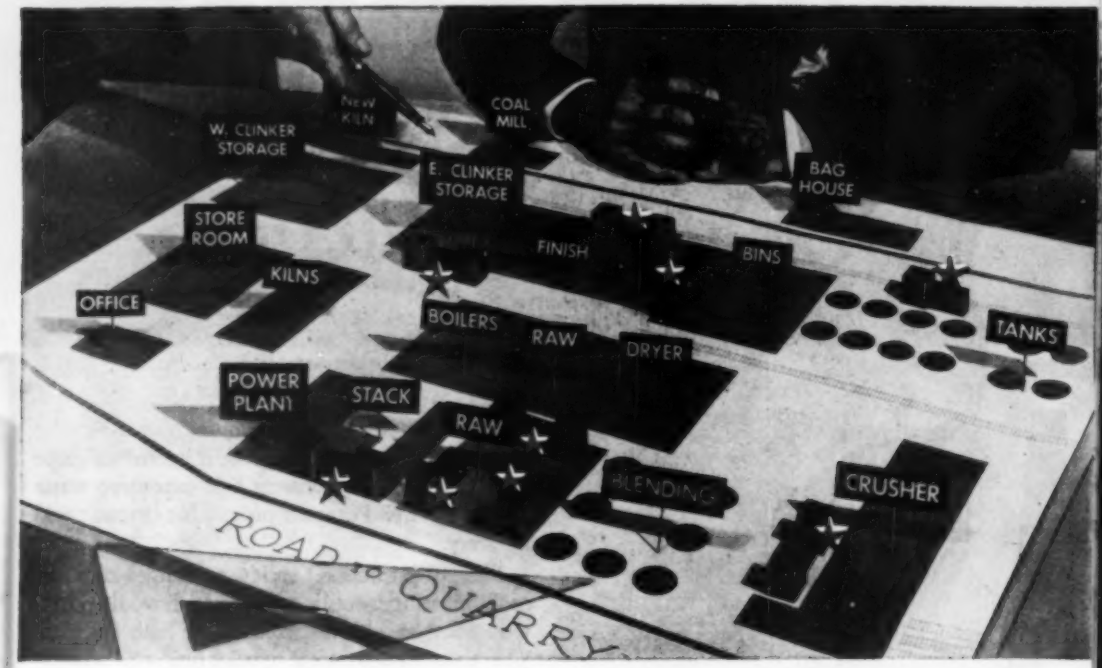
• • •

For full details, write to The Permutit Company, Dept. CE-9, 330 West 42nd Street, New York 18, N. Y., or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.

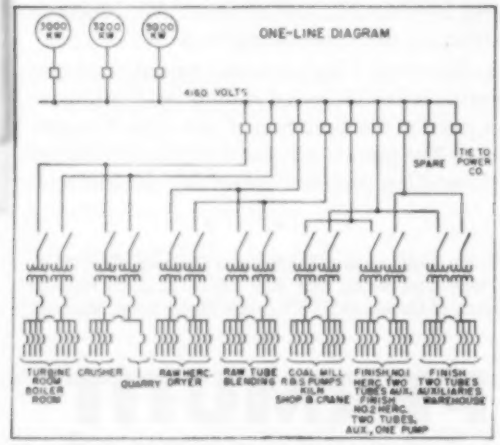
PERMUTIT®

ION EXCHANGE HEADQUARTERS FOR 38 YEARS

Dewey Portland Cement Co. solves



Modernized System gives additional capacity

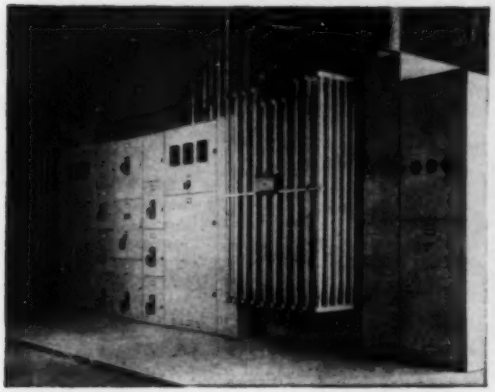

ONE-LINE DIAGRAM
4160 VOLTS
SPARE
TIE TO POWER CO.
TURBINE ROOM BOILER ROOM
CRUSHER
QUARRY
RAW MERC. DRYER
RAW TUBE BLENDING
COAL MILL & B.S. PUMPS KILN SHOP & CRANE
FINISH NO.1 MERC. TWO TUBES AUX. FINISH NO.2 MERC. TWO TUBES, AUX., ONE PUMP
FINISH TWO TUBES AUXILIARIES WAREHOUSE

One-line diagram showing new load-center distribution system. Turbine-generators supply voltage at 4160 volts wye. High voltage is stepped down to utilization level 480Y/277-v right in the load areas. Two sources of power for each load-center unit assure the 24-hour-a-day service.

For 30 years, waste heat from the cement kilns has enabled the Dewey Portland Cement Company to generate most of its power. Additional power for peak loads and emergency conditions is supplied by a local utility.

Recently, increasing demands exceeded the capacity of the Company's two turbine generators, rated 3200 kw and 3000 kw, both at 480 volts. Since inadequate interrupting capacity of the switchgear equipments prevented further use of the local utility power, a critical problem developed.

a critical power supply problem



Double-ended load-center unit rated at 3000 kva. Seven of these are located throughout the plant. Since all units are the same size, it was possible to standardize switches, transformers, and breakers.

Old switchboard with exposed switches and conducters threatened safety of plant and personnel. Old oil circuit breakers could not provide adequate interrupting capacity if short circuit occurred.

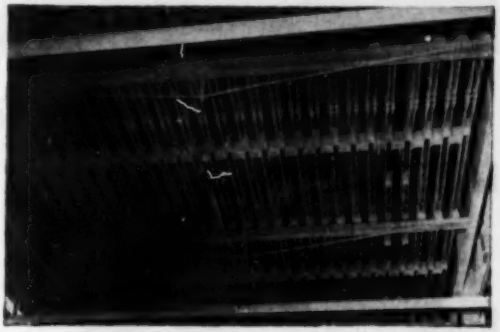
Load-center distribution key to power expansion

Called in by the Dewey Portland Cement Co., Dewey, Okla., G-E engineers found that an additional 5000 kw required by the plant could be supplied by a modern General Electric turbine generator, utilizing available waste heat.

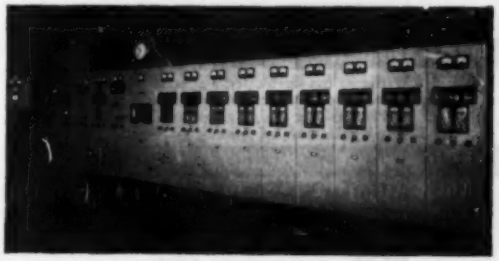
G-E specialists recommended a generated voltage of 4160 wye. Existing 480-volt generators were rewound and load-center unit substations were used to step down the voltage to utilization levels right in each of the plant load areas.

High voltage distribution eliminated tremendous quantities of heavy low-voltage conductor. Voltage drop was reduced. Flexibility was increased because later increases in power demand can be met by the simple addition of more load-center units without altering the over-all system.

Here's a typical example of the way General Electric engineers are helping industry meet today's demands for more power. For further information, contact your G-E sales representative, or write for Bulletins GEA-5600—"Power for Industry's Third and Biggest Expansion" and GEA-3592—"Load-center Unit Substations." *General Electric Co., Schenectady 5, N. Y.*



¼" x 6" bus previously needed to distribute power at 480 volts made this roof a veritable "copper mine." With new high-voltage distribution, buses were eliminated.



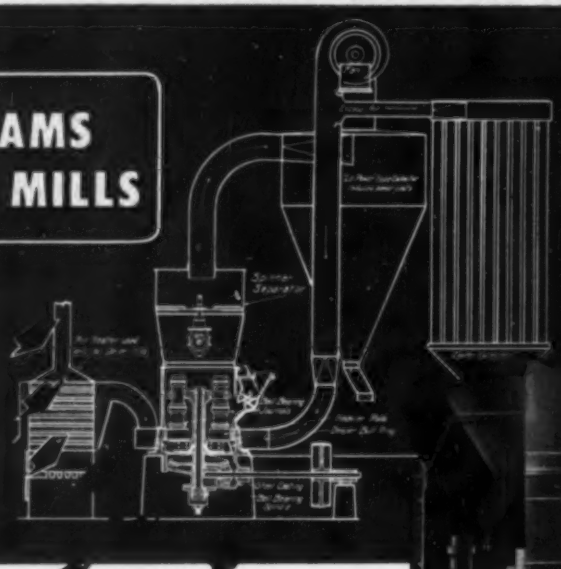
New metal-clad switchgear has adequate interrupting capacity. All breakers are rated 4160 volts, 1200 amperes, 250,000 kva. Completely metal enclosed, they provide greater protection for personnel.

GENERAL ELECTRIC

321-81

For those Fine Grinding Jobs . . .

WILLIAMS ROLLER MILLS



Blueprint illustration—Williams drying, grinding and separating unit.

let's look at the record

PYRETHRUM AND OTHER FIBROUS INSECTICIDES

The Williams Roller Mill has given excellent results in the grinding of various rotenone bearing insecticides as it pulverizes the fibres to the same uniform fineness as the rest of the plant. Pyrethrum flowers can be pulverized to 98.5% passing 200 mesh. Also grinds D.D.T., Sodium Fluoride, etc.

PAINTS, PIGMENTS, DRY COLORS

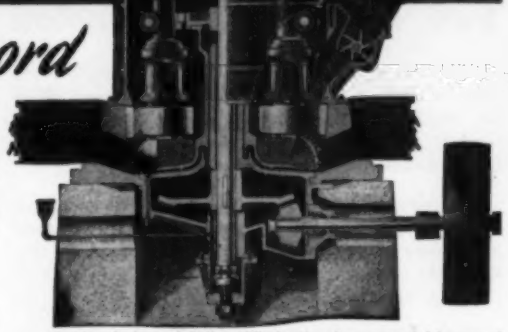
Williams Roller Mills are establishing remarkable records in the grinding of pigments and dry colors to finenesses of 99.95% 325 mesh and finer. Fineness instantly changed by varying speed of Spinner Separator Blades.

FINE GRANULATIONS

Williams has developed a special type of impact pulverizer to operate in connection with the air separator for the making of fine granulations of 30 to 80 mesh with a minimum of fines.

BARYTES, PHOSPHATE, LIMESTONE

Almost any mineral can be economically pulverized with the Williams Roller Mill. Finenesses quickly changeable from 40 mesh to 400 mesh. All can be dried and ground simultaneously by introduction of hot air.



Sectional view of Roller Mill showing how material is ground between rolls and bull ring, then air swept to Separator which extracts fines and returns oversize for re-grinding.

WILLIAMS ALSO MAKES . . .

Heavy-duty hammermills; impact and roller mills for 200 to 325 mesh grinding; drier mills; air separators; vibrating screens; steel bins; complete "packaged" crushing and grinding plants.

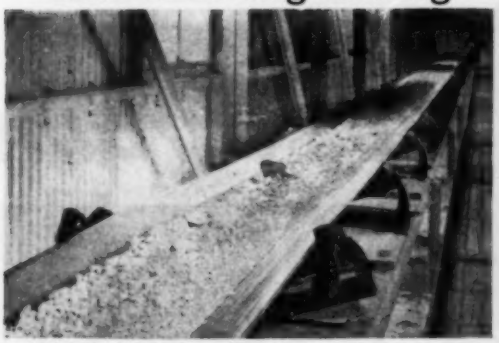
WILLIAMS PATENT CRUSHER & PULVERIZER CO.
2706 N. NINTH STREET ☆ ST. LOUIS 6, MO.

WC49-11

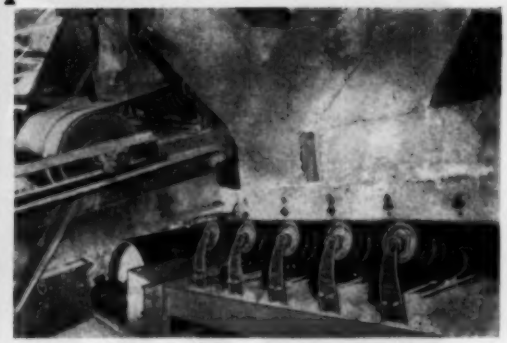
WILLIAMS

CRUSHERS GRINDERS SHREDDERS

LINK-BELT engineering experience...

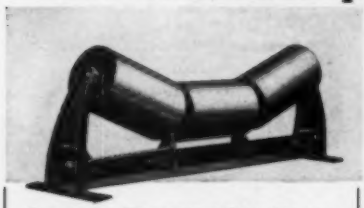


GYPSUM ROCK is carried at rate of 500 tph from ship's side to open yard storage by 30-inch Link-Belt Belt Conveyors.



JUNCTION OF Link-Belt Belt Conveyors, showing rubber-tread impact idlers at loading points and welded steel foot pulleys.

Plus LINK-BELT quality components...



SERIES 100 TROUGHED BELT IDLERS. Strong, balanced integral rolls revolve on high-grade roller bearings. Grease-in, dirt-out seal, large reservoir preserve lubricant.

RUBBER-TREAD IMPACT IDLER for loading points protects the belt by absorbing the shock of heavy materials or lumps delivered from above.

BELT-TRAINING IDLER for automatic belt positioning. The actuating rolls respond to slightest contact — quickly recede and center the belt to minimize wear.

...add up to your best bet in

BELT CONVEYORS

WHAT'S your materials handling problem? Tonnage, distance or a combination of the two? Heavy or light materials? Large lumps or fines? Continuous or intermittent operation?

Whatever the conditions, you'll find the right answers at Link-Belt. For Link-Belt designs conveyor systems to meet your requirements. Backed by unmatched materials handling and power transmission experience, our conveyor specialists help you and your consultants get the right equipment in the right place.

One Source—One Responsibility

Link-Belt makes all the various elements — all types and sizes of idlers, takeups, pulleys, trippers, bearings and power transmission drives. Plus all related equipment — other types of conveyors, feeders, elevators, car dumpers and shakers.

And Link-Belt will build your supporting structures and enclosures . . . install the job completely. One source — one responsibility. Every detail receives the proper attention to assure you an efficient, trouble-free, long-life conveying system.

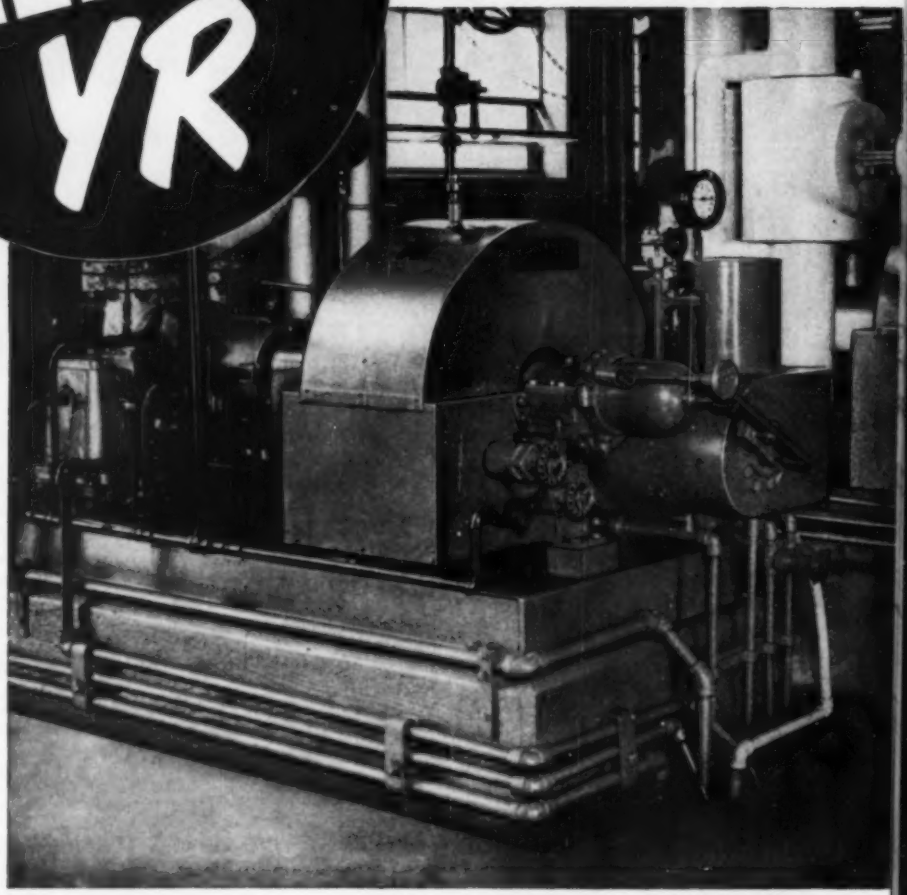
The next time you need belt conveyor engineering assistance, call the Link-Belt specialist in our office near you.

LINK-BELT

BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,300

ELLIOTT YR *the Turbine*



Elliott YR turbines may be furnished, when so specified, with carefully tailored, neat appearing, and readily removable jacketing, as in this installation.

ELLIOTT COMPANY

STEAM TURBINE DEPT.
JEANNETTE, PA.
Plants at: JEANNETTE, PA. • RIDGWAY, PA.
AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.
DISTRICT OFFICES IN PRINCIPAL CITIES

that has everything!

1 ADAPTABILITY— Every plant engineer wants turbines tailored to his needs—if he can get them. In the YR, he can—and without sacrifice of standardization. Permissible modifications cover the widest possible range. Actually, eight types of turbines are available on five basic frames . . . one basic design of governor valve, six elective types of governor . . . several types of speed changer, emergency tripping mechanisms . . . gland seal arrangement for condensing operation and for operation with gas . . . with these and a number of other modifications practically any requirements can be met.

2 RELIABILITY— Here is a quality for which Elliott turbines have long been renowned. In the YR, this quality has been further enhanced by improving manufacturing facilities and details of design upon which reliable operation depends.

3 ECONOMY— Added to the operating saving in using a turbine practically built for its specific conditions, is the further direct saving in the reduction in stocking replacement parts due to the interchangeability of wearing parts on all frame sizes. One of the benefits of standardization.

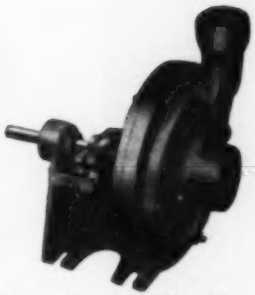
4 REPUTATION— The high standing which Elliott turbines have earned everywhere is the best safeguard an engineer can have to sustain his selection of YR turbines. As one engineer said to another who had been having drive troubles, "Why don't you put in Elliott turbines and stop worrying?" In this he voiced an opinion almost universally held.

Whatever you want in a mechanical drive turbine you can get in a YR. Bulletin H-36 has all the details—write for it.

H-789

STEAM TURBINES • GAS TURBINES • GENERATORS • MOTORS • CONDENSERS
FEEDWATER HEATERS AND DEAERATORS • STEAM JET EJECTORS
CENTRIFUGAL BLOWERS • TURBOCHARGERS FOR DIESEL ENGINES
TUBE CLEANERS • STRAINERS • EXPANDERS • FILTERS

It's easy to get the right pump!

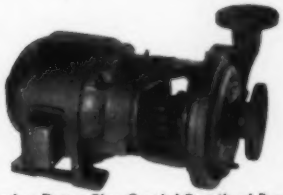


Gardner-Denver Side-Suction Centrifugal Pump

Call your Gardner-Denver field engineer. He'll gladly work with you in planning the most economical and efficient pumping layout. And he's an expert at specifying the *correct* pump for every installation.

He may recommend the compact Gardner-Denver Close-Coupled Centrifugal, which may be installed in many positions—or the easy-to-hook-up Gardner-Denver Side-Suction Centrifugal—or the heavy-duty Gardner-Denver Double-Suction Centrifugal. All Gardner-Denver pumps are built in a wide range of capacities—can be furnished in corrosion or abrasion resisting materials when required.

Write us today for complete information. Ask for the name and address of the Gardner-Denver pumping engineer nearest your plant.



Gardner-Denver Close-Coupled Centrifugal Pump

Gardner-Denver Double-Suction Centrifugal Pump

SINCE 1859

GARDNER-DENVER

THE QUALITY LEADER IN PUMPS, COMPRESSORS AND ROCK DRILLS

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada) Ltd., Toronto, Ontario

IDEA-PLASTICS

... from Du Pont Polychemicals Department

ALATHON* POLYTHENE RESIN

makes a new kind of closure

They've made pail closures out of many materials . . . but it wasn't until one manufacturer tried "Alathon" polythene resin that this truly unusual kind was developed. "Alathon" is almost completely inert . . . this new closure withstands any liquid that is shipped in commercially lined pails. For the same reason, "Alathon" won't contaminate the contents in any way. And because "Alathon" is also a flexible material, the closure could be designed to do two jobs. First, it provides an airtight, tamper-proof, moisture-proof seal. Then when the seal is cut, the closure pulls out easily to form a clean-pouring spout.

The properties of "Alathon" polythene resin make it a valuable plastic for other industries, too—for example, in the packaging, paper-coating, and electrical fields. And they suggest many new applications. A few possibilities are: as shoe components, as battery parts, and as a binder for non-woven fabrics.

There's a good chance your business may

find opportunities for profitable future use in "Alathon" polythene resin . . . or perhaps in many of the other Polychemicals products. There are more than 100 of them—organic acids, amides, alcohols, ammonia, esters, resins, solvents and plastics.

Although demand for many of these products now exceeds supply, we will gladly discuss the availability of experimental quantities for developmental work.

Write for Technical Booklet on Polychemicals Products for Your Industry

Technical bulletins on "Alathon" polythene resin and the chemicals and plastics used in your industry are available. Each product bulletin in the booklet presents physical and chemical properties, description, specifications, uses and possible applications, bibliography and other data. Write us on your business letterhead for your copy—and please tell us the name of your industry, or type of application that you have in mind.

E. I. du Pont de Nemours & Co., Inc.
Polychemicals Department, 159E Nemours Building
Wilmington 98, Delaware

*REG. U. S. PAT. OFF.

DU PONT
REG. U. S. PAT. OFF.
BETTER THINGS FOR BETTER LIVING
... THROUGH CHEMISTRY
Polychemicals
DEPARTMENT
PLASTICS • CHEMICALS

'The Travelers' Buys Bunker Insurance!

THE TRAVELERS Insurance Company of Hartford, Conn., has long-term insurance against bunker oil heating problems. They use a Thermal Electric Standard System to remove bunker oil from *unheated* storage and transport it to the pump-type burners at a precisely controlled flow temperature. ☆ Fully automatic, all-electric operation eliminates remote pump-sets, multiple suction lines, and complicated recirculation equipment. This gives Travelers extra dividends in the elimination of maintenance costs for bunker transport. ☆ We write insurance, too. We've *guaranteed* the Travelers installation, as we guarantee all correctly installed Thermal Electric Standard Systems, to give 100% trouble-free performance!

THE TRAVELERS' THERMAL ELECTRIC BUNKER OIL LAYOUT

Note simplicity and similarity to layout for free-flowing oil.

HOW IT WORKS

The Thermal Electric Transforming Energizer passes safe 20-volt current through the pipes that carry the fuel, generating even heat. The Thermostat and Control Panel automatically regulate the fuel temperature at 120°F. During shutdown, fuel can be kept heated in the pipes without constant or cycle burner operation. System can be shut off without draining — Thermal Electric will melt out the pipes electrically.

Send in the coupon and get the whole story of how Thermal Electric can give you the same advantages.

PAT. NO. 2,554,402

Thermal Electric Fluid Systems, Inc.

Fluid Systems, Inc., 1881 Dixwell Ave., New Haven, Conn.

Please send without obligation "The Common Sense of Heavy Fuel Transport" plus Customer List of hundreds of users, including many insurance firms.

Name _____

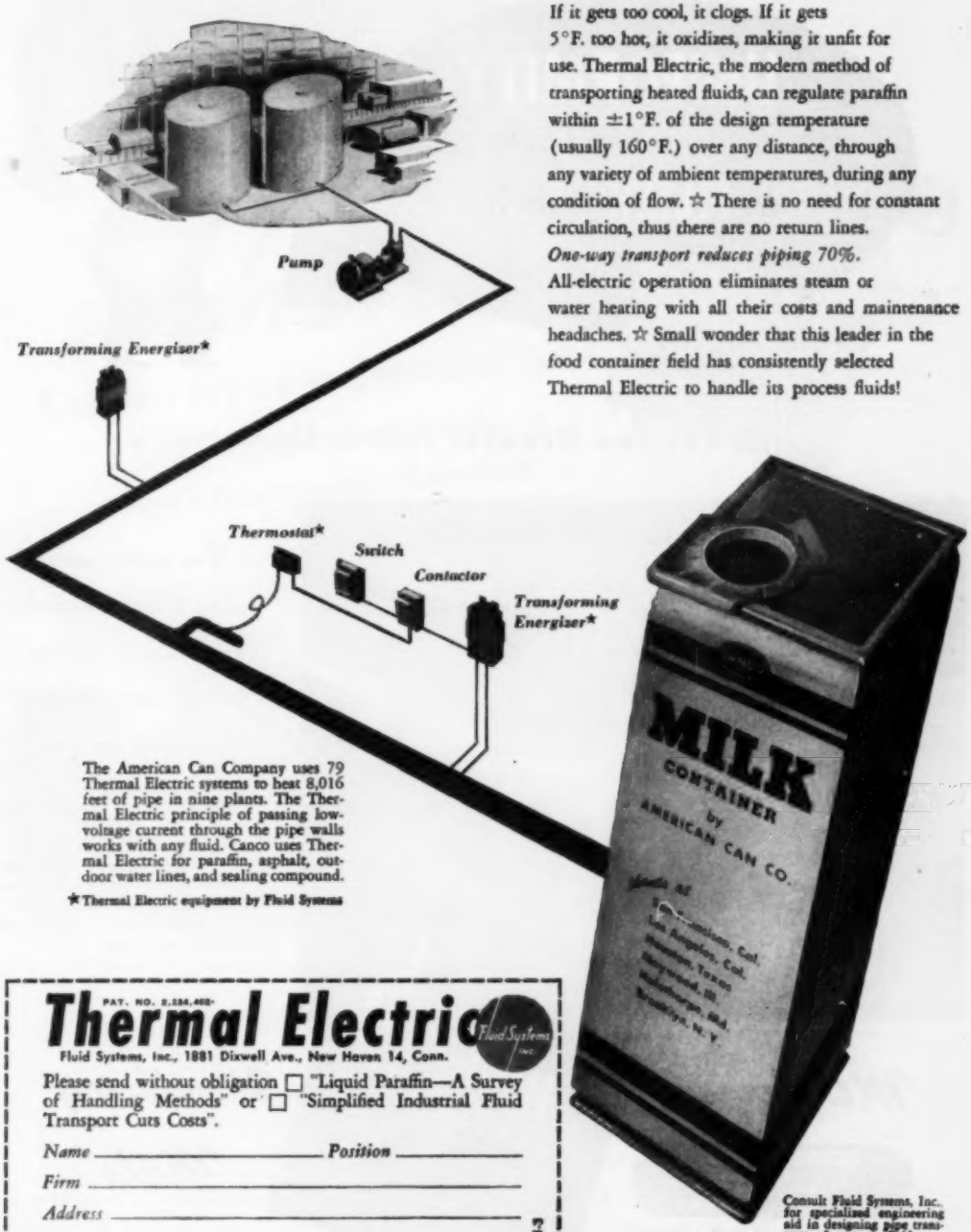
Firm _____

Street _____

City _____ *State* _____ CES-3

Thermal Electric and Fluid Systems, Inc. are trade marks registered in U.S. Pat. Off.

Making Wax Work for American Can Company



Liquid paraffin is a temperamental fluid. If it gets too cool, it clogs. If it gets 5°F. too hot, it oxidizes, making it unfit for use. Thermal Electric, the modern method of transporting heated fluids, can regulate paraffin within ±1°F. of the design temperature (usually 160°F.) over any distance, through any variety of ambient temperatures, during any condition of flow. ☆ There is no need for constant circulation, thus there are no return lines. *One-way transport reduces piping 70%.* All-electric operation eliminates steam or water heating with all their costs and maintenance headaches. ☆ Small wonder that this leader in the food container field has consistently selected Thermal Electric to handle its process fluids!

The American Can Company uses 79 Thermal Electric systems to heat 8,016 feet of pipe in nine plants. The Thermal Electric principle of passing low-voltage current through the pipe walls works with any fluid. Canco uses Thermal Electric for paraffin, asphalt, outdoor water lines, and sealing compound.

★ Thermal Electric equipment by Fluid Systems

Consult Fluid Systems, Inc. for specialized engineering aid in designing pipe transport of process fluids.

PAT. NO. 2,584,460

Thermal Electric Fluid Systems Inc.

Fluid Systems, Inc., 1881 Dixwell Ave., New Haven 14, Conn.

Please send without obligation ☐ "Liquid Paraffin—A Survey of Handling Methods" or ☐ "Simplified Industrial Fluid Transport Cuts Costs".

Name _____ *Position* _____

Firm _____

Address _____

City _____ *State* _____ CE-9

THERMAL ELECTRIC and FLUID SYSTEMS, INC. are trade marks registered in the U.S. Pat. Off.

UNIFORMITY FILTER

MT. VERNON EXTRA

Gives You Greater Fabric Uniformity

The greater uniformity of Mt. Vernon Extra means more efficient filtering — greater clarification of filtrates, more complete recovery of solids.

AT YOUR SERVICE

Mt. Vernon-Woodberry's staff of textile engineers is available on request to help you with your problems in development or application of industrial fabrics.

Mt. Vernon — Woodberry Mills

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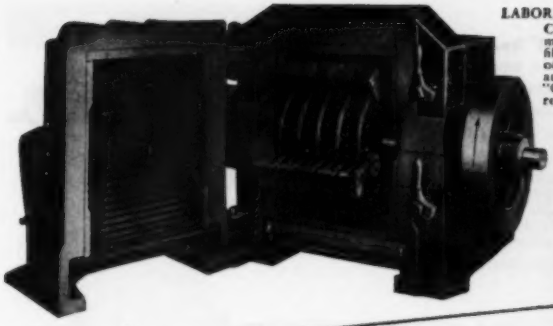
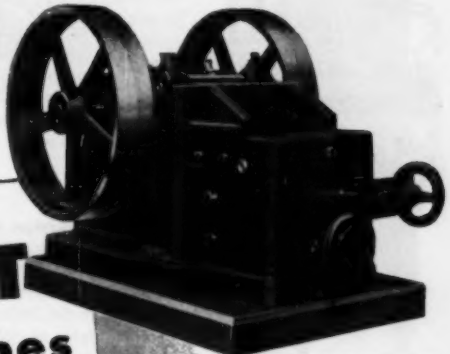
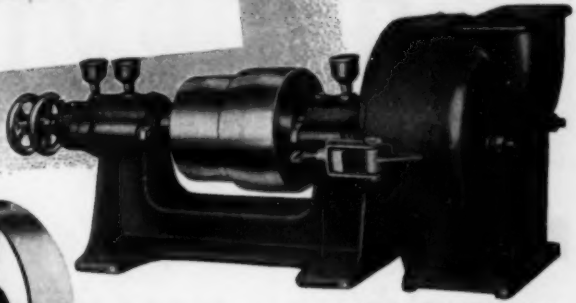


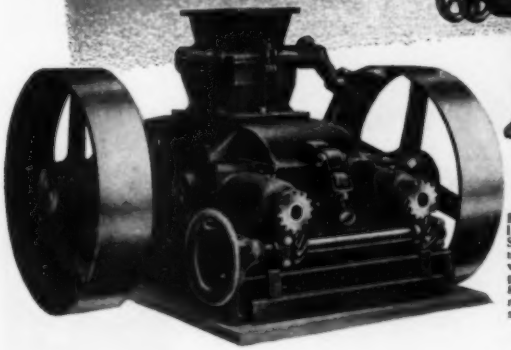
LABORATORY SWING-SLEDGE MILLS
Capable of reducing soft, moderately hard and tough or fibrous materials to any degree of fineness between 1 in. and 20 mesh. The patented "Open-Door" feature permits ready accessibility for cleaning.



STURTEVANT
Laboratory Machines
Assure Quality of Products
Fast - Economical - Accurate

LABORATORY JAW CRUSHERS
Special Roll Jaw action simplifies close regulation of the product with capacities varying from 300 or 400 lbs. per hour at finest settings, to 1000 or 2000 lbs. when opened for coarser work. Each part of the crusher is accessible for quick and easy cleaning.





LABORATORY CRUSHING ROLLS
First designed especially for laboratory sampling work, Sturtevant Crushing Rolls are used regularly in many plants where there are limited outputs. Range of output for the 8 x 5 size is from ½ in. to 20 mesh — and for the 12 x 12 size from ¾ in. to 20 mesh.

LABORATORY SAMPLE GRINDER
Laboratory Sample Grinders are of the "Open-Door" disc type and are capable of very fine work, producing products as fine as 100 mesh (coarser if desired) when working on dry, friable, soft or moderately hard materials. Simply turn hand wheel to provide product regulation from 10 to 100 mesh.

The only sure way to maintain strict quality of products is laboratory control . . . and that calls for accurate sampling.

Sturtevant Laboratory Equipment meets the exacting requirements of laboratory work. They are fast and accurate . . . provide true samples.

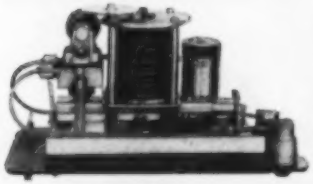
Rugged and dependable, Sturtevant equipment actually has all the features of full size machines plus extra accuracy and wider range of adjustment. The "Open-Door" accessibility permits quick, thorough cleaning . . . prevents the possibility of previous batches from contaminating new samples.

Investigate Sturtevant equipment for your laboratory. It will cut your sampling costs . . . help maintain strict quality of products . . . increase sales. Write for complete details and catalog.

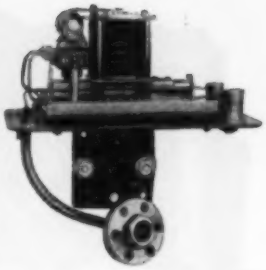
STURTEVANT MILL COMPANY
100 CLAYTON STREET, BOSTON 22, MASS.

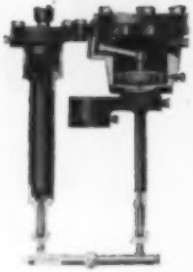
Designers and Manufacturers of: CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS • MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

MEASURE

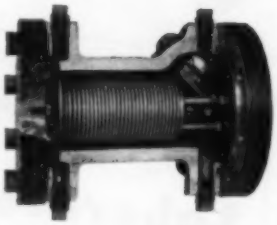


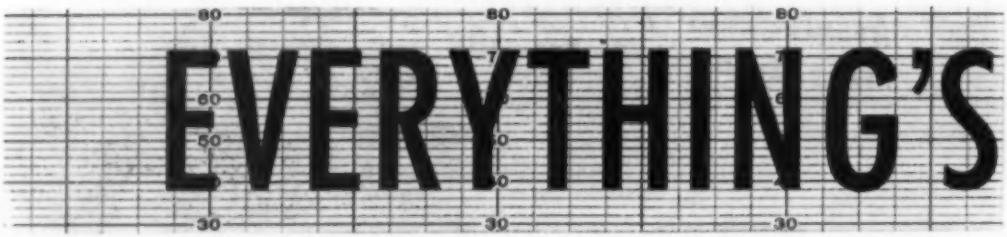
Taylor TRANSAIRE® Transmitters virtually eliminate time lag in measuring and transmitting smallest temperature and pressure changes. Temperature model (*left*) has derivative action, SPEED-ACT®, in measuring circuit, which assures dynamic accuracy under changing conditions. Pressure model (*right*) will detect changes of 1/10 of 1% of the range span, accurate to 1/2% of span rather than pressure level. Temperature and barometric compensation assure consistent accuracy.



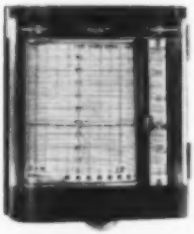


Taylor Differential Pressure Manometers give accurate, dependable measurement of flow, liquid level and specific gravity. Mercury model (*left*) is accurate to ½ of 1% of the range, has interchangeable tubes for continuous ranges from 10 to 500 inches of water. Aneroid (mercuryless) models (*right*) of 300 and 1500 psi working pressures. Range limits: 0 to 20" to 0 to 500" water. Also available in all-316 stainless steel for corrosive mediums.





RECEIVE

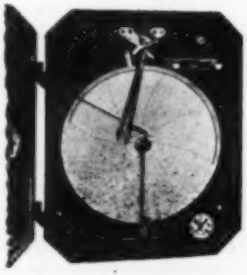


The TRANSET Recorder (*left*) has automatic-manual unit, remote set-point adjustment and valve position indicator. Takes only 4¾" x 5" panel space, gives a continuous 30-day linear chart record, with 3 hours visible. Electric or pneumatic chart drives.

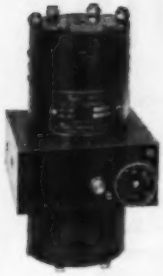
The TRANSET Indicator (*right*) has all the features of the TRANSET Recorder, but gives no chart record. Easy reading 3½" dial, mounts in same size panel opening as TRANSET Recorder.

TRANSET Receiving Flow Integrator (*left*) also takes just 4⅜" x 5" panel space. It totals the flow of liquids and gases, is available in square root or linear forms. Like the other TRANSET Receivers, its small size makes it ideal for graphic panels.

Taylor 84JF Recording Receiver (*right*) is an alternate part of the TRANSET System designed for those who want matching cases on conventional panel boards. Has all the features of the small TRANSET Recorder, but utilizes standard 12" circular charts.

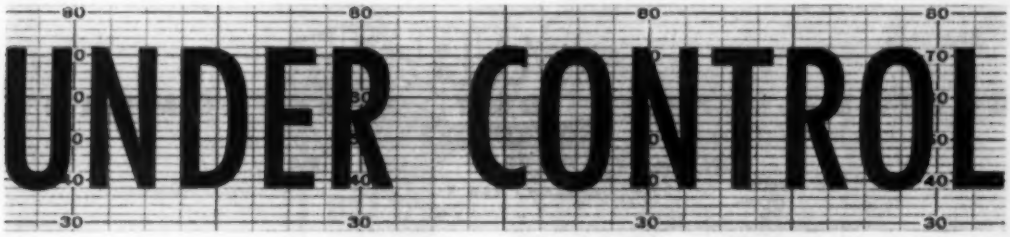


CONTROL



The TRI-ACT* Controller (*right*) is a force-balance pneumatic controller with a new circuit embodying three control responses: proportional, PRE-ACT* (rate action) and automatic reset. Gives precise control never before believed possible, with faster, more stable recovery on load changes, no overpeaking on start-up. Can be locally or panel mounted.

BI-ACT* is TRI-ACT's little brother. The BI-ACT Controller (*left*) is a lower cost instrument with *two* control responses, proportional and automatic reset, both adjusted with *one* stability knob. It's the ideal instrument for dependable, accurate performance on those applications where the quality of control obtainable with derivative response is not essential.



with Taylor's TRANSET System regulating any process variable*

*Trade-Mark

THE ANSWER to almost any industrial control problem is on these pages. Taylor's New TRANSET Control System can control practically any process variable, with a precision never before possible.

A wide variety of units available within each of the system's three steps, measuring, controlling and receiving, makes TRANSET Control adaptable to fit your control requirement perfectly. Each unit incorporates brand-new features and techniques, and the units in each step are designed to take fullest advantage of the superior performance of units in the other steps. It's an unbeatable team that can cut costs and improve product quality in any process industry.

For full information on how you can profit from Taylor TRANSET Control, ask your Taylor Field Engineer, or write for **Bulletin 98097.** Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

Taylor's Centennial

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

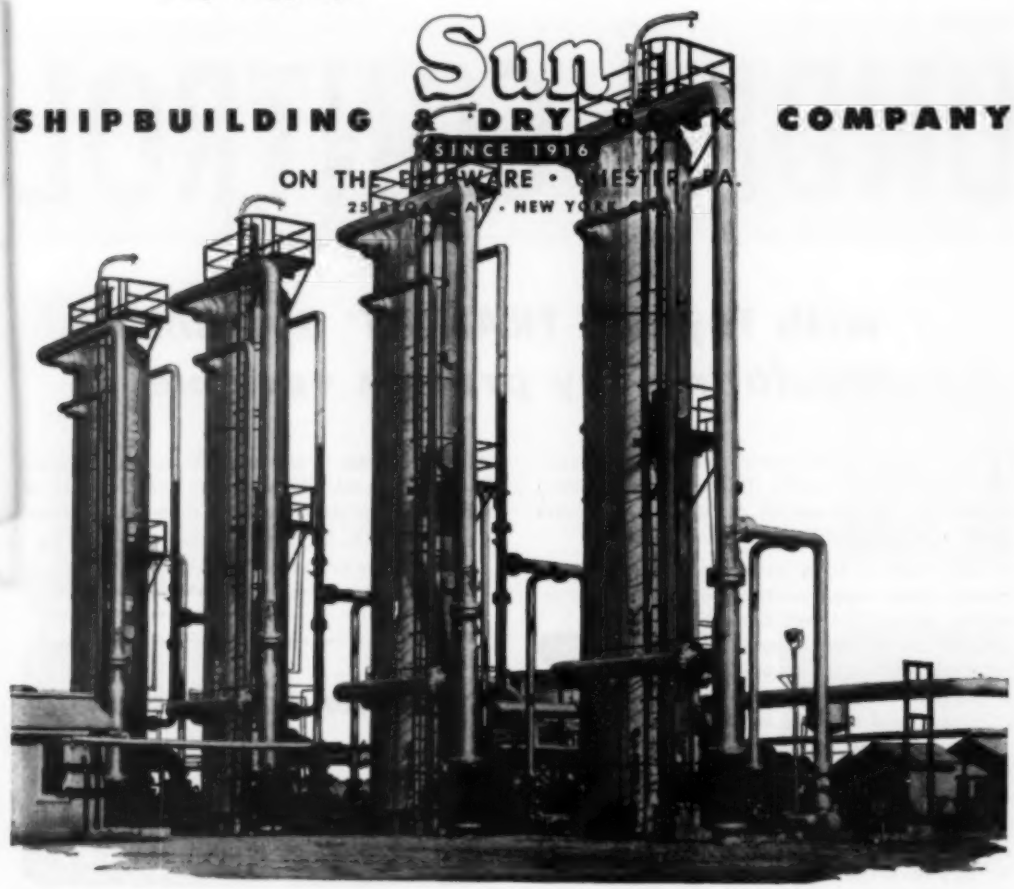
Built FOR better LIVING

That is what the carefully patterned mazes of refinery equipment, produced by Sun for many leading refineries, mean for America.

These towering refineries mean light, heat, comfort and power for the nation's homes and industries . . . fuel for transportation by ship, rail and motor car . . . mobility for our naval and military forces.

They must not fail . . . *they will not fail!* Into their making have gone Sun's engineering skill and craftsmanship, time-tested in wide fields of mechanical production . . . in refinery and chemical plant equipment, in shipbuilding, in fabricated steel work, in the renowned and powerful Sun-Doxford marine Diesel engines and other specialized machinery.

The more exacting the specification, the greater opportunity for Sun to maintain its engineering prestige.



What's Back of

SOLVAY

TRADE-MARK REG. U. S. PAT. OFF.

PRODUCTS?

Most chemicals are bought on the basis of carefully prepared specifications. However, the experienced buyer of chemicals looks *behind* the product and checks on the background, facilities and services that the manufacturer has to offer.

In back of every Solvay product, you will find a reputation for high quality and uniformity . . . a reputation that has been maintained since Solvay started producing America's first alkalies. This, plus the following services, has helped make Solvay the leader for seventy years.

★ **SOLVAY "INDUSTRY-WISE" TECHNICAL SERVICE** . . . offers expert knowledge and long experience in the handling, use, storing and compounding of Solvay products.

★ **LABORATORY AND FIELD RESEARCH** . . . a competent staff of technical specialists, working with the finest modern equipment.

★ **STRATEGICALLY-LOCATED PLANTS AND STOCK POINTS** . . . five plants and over two hundred stock points for convenient shipping.

★ **SOLVAY SALES SERVICE** . . . thirteen branch offices staffed by a group of experienced salesmen . . . plus an organization of jobbers, distributors and dealers covering the entire country.

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ALLIED CHEMICAL & DYE CORPORATION
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70 YEARS OF SERVICE
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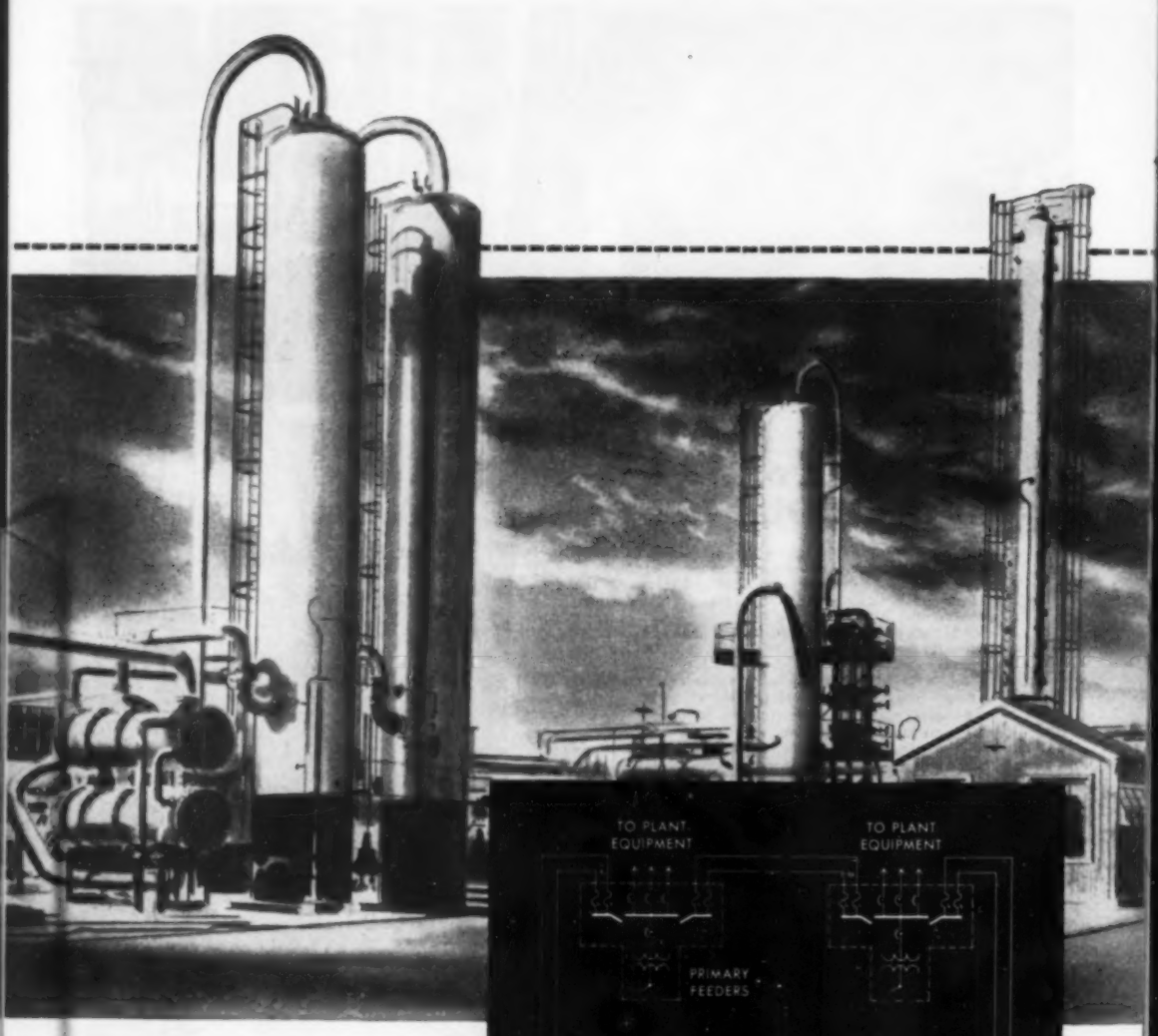
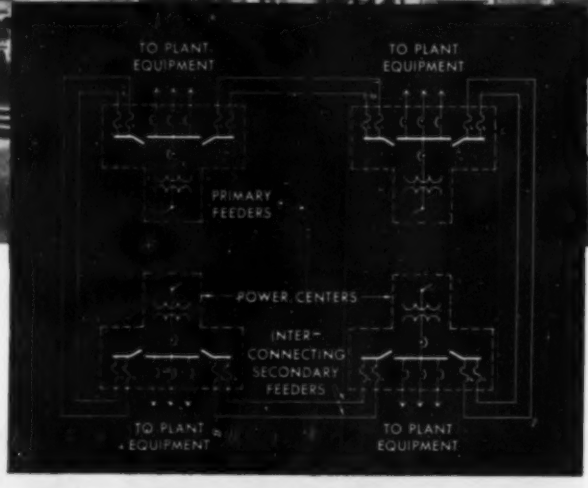
Formaldehyde • Monochlorobenzene • Para-dichlorobenzene • Ortho-dichlorobenzene
Ammonium Bicarbonate • Ammonium Chloride





PRIMARY SELECTIVE NETWORK SYSTEM

This system rates high on service continuity and flexibility. Two Primary Feeders supply power. If a fault occurs on one, the other Feeder takes over to keep service continuous. If a fault occurs in a Power Center, its section of the plant is supplied by the adjacent Power Centers through the interconnecting Secondary Feeders.

When additional power is needed, one Primary Feeder supplies the plant while a new Power Center is connected to the dead feeder. The plant keeps operating.

This is one of eleven basic systems, all with varying characteristics. Let experienced Westinghouse engineers help you plan the system best fitted to *your* operations.

Westinghouse

EQUIPMENT FOR THE CHEMICAL INDUSTRY

WESTINGHOUSE

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

HOW MUCH DOES IT COST

when a distilling column goes "down"?

Probably more than you care to think about. But when power failure is at fault this costly threat can be eliminated. The answer:

A planned power distribution system!

When you modernize existing plants or build new ones, plan a system that *insures* service continuity . . . that gives you *alternate* power routes when electrical troubles occur. Moreover, make sure the system will be flexible . . . to permit load shifts and allow expansion without shutdown.

The Primary Selective Network shown on the opposite page is an example of a system that gives you this important service continuity and flexibility. But this is just one of the many systems you'll want to consider. Each has specific advantages depending on your particular operation. And Westinghouse can help you and your plant contractor design the system that *best* fits your requirements.

To help you make preliminary decisions we've prepared informative material covering all systems. Write for yours now. And remember, when you're building or modernizing, call in your Westinghouse engineers. With wide experience in power problems they can help you plan the one best system for your particular operation. J-94856

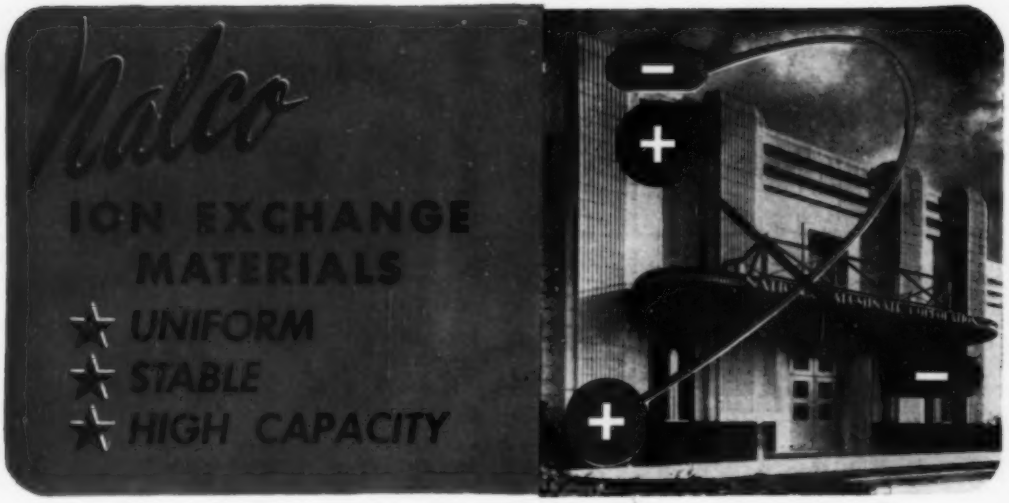
HERE'S REAL HELP FOR YOUR SYSTEM PLANNING

"Industrial Plant Distribution Systems": 34 fact-filled pages completely explain the eleven basic systems. Ask for B-4045.

A System Selector: pocket-sized selector card quickly shows the characteristics of each type.

A Full-Color Movie: sound movie dramatizes the economies of system planning. Ask your Westinghouse representative for a free showing.

Get this valuable information now. Call your Westinghouse office or write: Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.



Outstanding physical and chemical characteristics of Nalco ion exchange materials provide excellent opportunities for development of new processing uses—as well as for maximum utilization of conventional ion exchange techniques. Here are quick facts on three of the Nalco ion exchange materials:

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CATION EXCHANGE RESIN

Styrene type cation exchange resin for fast efficient removal of metal ions from water and a wide variety of process liquids. Either salt or acid regeneration. High operating capacity (Up to 32,000 grains per cubic foot) with no capacity loss at high temperatures (Up to 250° F) or over the entire pH range.

Nalcite SAR

STRONGLY BASIC ANION EXCHANGE RESIN

For substantially complete removal of all acid-radical constituents from water and processing liquids. Operates efficiently over a wide pH range (2.0 to 10). Microspheres of uniform size range.

Nalcite WBR

WEAKLY BASIC ANION EXCHANGE RESIN

A new polystyrene-polyamine type anion exchanger of high chemical stability. High capacity for removal of the stronger acids makes Nalcite WBR particularly applicable for demineralization techniques. Supplied in bead form.

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6236 West 66th Place
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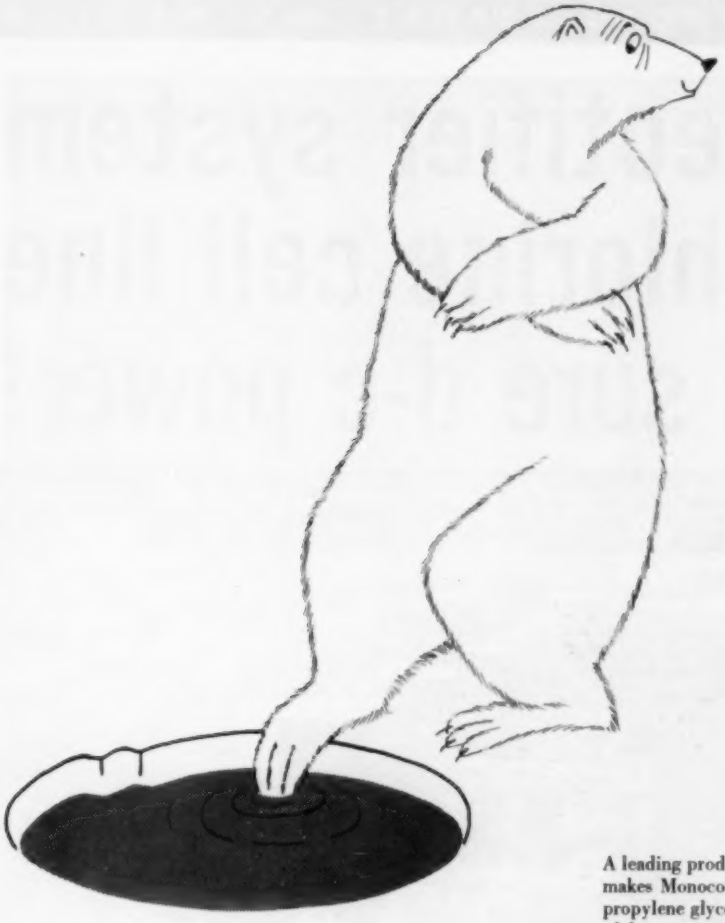
Canadian inquiries should be addressed to Alchem Limited, Burlington, Ontario, Canada

More Data on any or all Nalco ion exchange materials will be furnished promptly upon request. Nalco Laboratory and Engineering facilities available for specialized ion exchange research and development.

Nalco

PRODUCTS . . . Serving Industry through Practical Applied Science



Hard to freeze—

Wyandotte Glycol

A leading producer of glycols, Wyandotte makes Monocol*, a mixture of ethylene and propylene glycol, and Dicol*, a mixture of the corresponding diglycols.

Monocol is an antifreeze. It's used mostly in automobiles, in refrigeration and air conditioning systems. And it's a lubricant in frigid zones.

Monocol and Dicol are solvents. They dissolve dyes and resins for the textile and synthetic resin industries. Either serves as a coupling agent for soluble oils in perfumes, a plasticizer and a humectant.

Our glycols are currently in short supply. But we'd be glad to discuss possible applications to your problem.

*Reg. U. S. Pat. Off.

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CALCIUM CARBONATE • CALCIUM CHLORIDE • CHLORINE
HYDROGEN • DRY ICE • SYNTHETIC DETERGENTS • GLYCOLS
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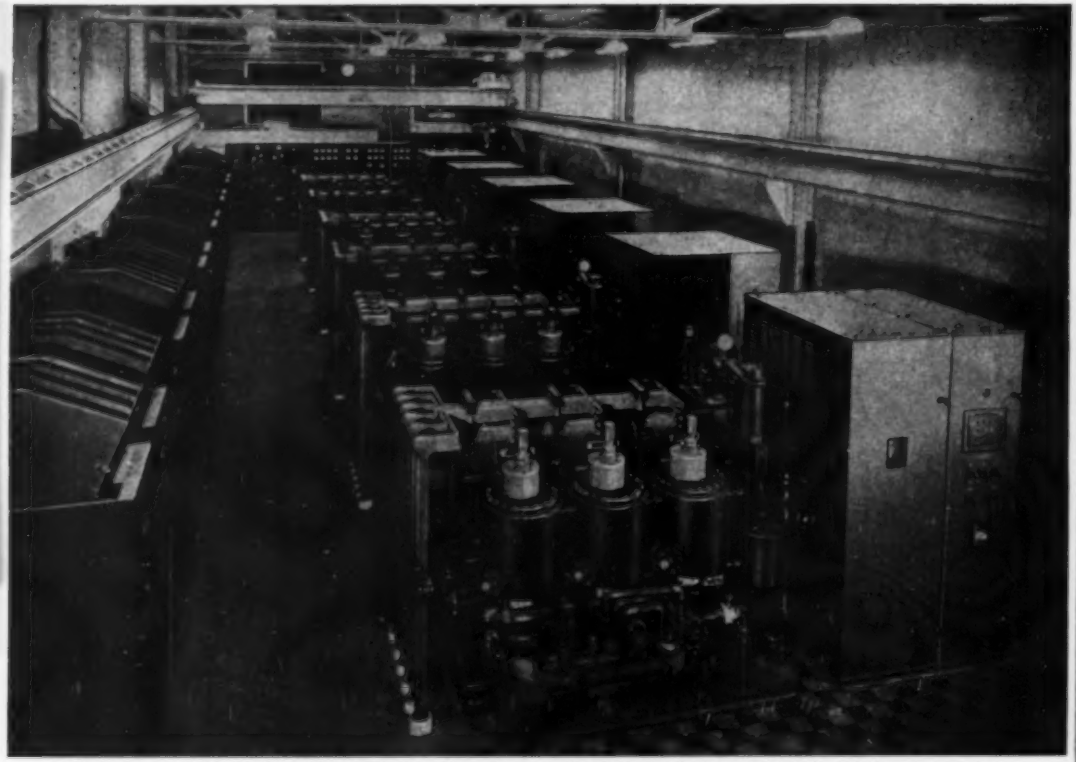
—A PHOTO-REPORT ON MODERN

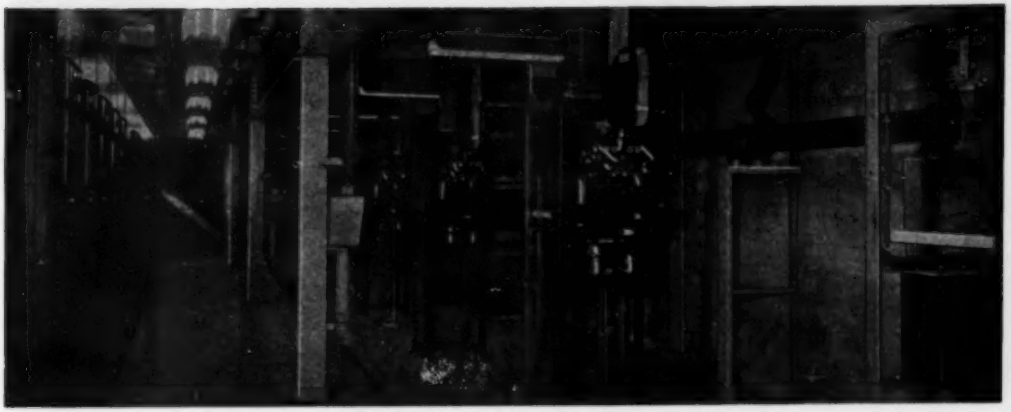
G-E rectifier system for chlorine cell line gives sure d-c power!



All equipment needed is included in Wyandotte's G-E rectifier system —from incoming power lines to load circuits. Upper floor (shown here) contains six ignitron rectifiers (center), with their anode breakers (left), and auxiliary control cubicles (right). At far end of room is operator's duplex panel, which centralizes control of all rectifiers and a-c circuits including additional equipment on floor below.

GENERAL ELECTRIC

663-37



Simple, practical layout was aided by G-E installation drawings. Lower floor houses main 13.8-kv a-c metal-clad switchgear (left) and cathode breakers (center), all controlled from operator's duplex panel on floor above. Note ample space for mounting, and easy maintenance access to cable conduits, d-c bus and disconnecting switches.

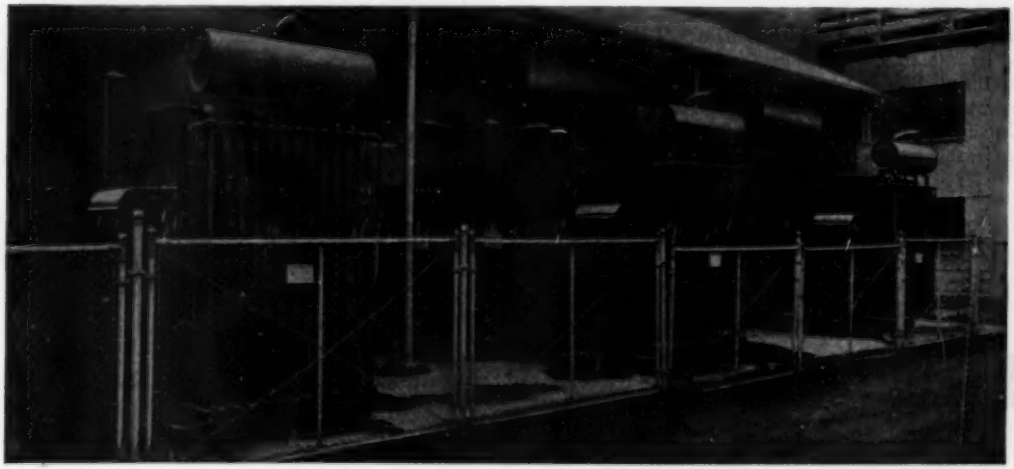
Wyandotte Chemicals Corp.—in expanding for greater production—installs complete, co-ordinated G-E system for top reliability and continuity of service

Here's another chemical plant that saved time and trouble by letting General Electric co-ordinate the electric equipment for an entire process. Of modern design and functional layout, this rectifier system embodies the reliability and service continuity that continuous electrolytic processes must have.

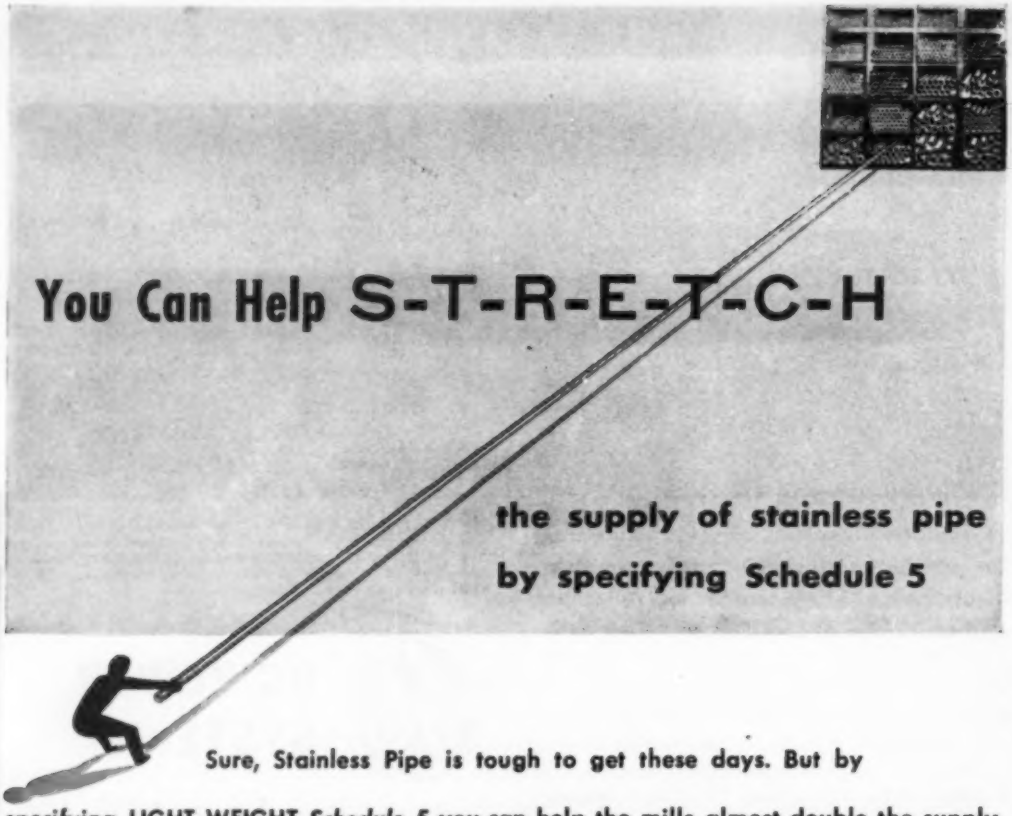
Whatever *your* chemical plant's electrical problems, an experienced G-E application engineer can help you solve them efficiently, economically. Ask your local G-E office. *General Electric Co., Schenectady 5, N. Y.*

DC POWER SYSTEMS

for electro-chemical plants



Outside the station, throat-connected to three rectifier transformers, are three autotransformers (in front), which provide flexible control for the electrolytic process. They are used for phase-shifting to give adequate multi-phase rectifier operation, and for tap-changing to provide the desired range of d-c voltage levels.



You Can Help S-T-R-E-T-C-H

the supply of stainless pipe by specifying Schedule 5

Sure, Stainless Pipe is tough to get these days. But by specifying LIGHT WEIGHT *Schedule 5* you can help the mills almost double the supply

Here is the answer

Wherever you buy your Stainless Pipe, get all the facts about the strength and other technical advantages of LIGHT WALL *Schedule 5* pipe. It weighs half as much as Schedule 40 pipe. It costs half as much. And it uses half the nickel and chrome because of its LIGHT WALLS. Yet, with all that, *Schedule 5* Stainless Pipe is plenty strong enough to give you complete safety for working pressures up to 150 psi. In sizes under 1½", working pressures can be considerably higher.

Before planning your next job "the same old way" with Schedule 40 pipe, talk to your steel distributor or producer. Consider taking full advantage of the strength of Stainless, by using LIGHT WEIGHT *Schedule 5* Stainless Pipe.

And here's your chance—Call your Carpenter Stainless Tubing Distributor or write to us for this set of Data Sheets on *Schedule 5* Stainless Pipe. They show *why* and *how Schedule 5* offers all industry more Stainless Pipe for essential uses.

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Alloy Tube Division, Union, N. J.
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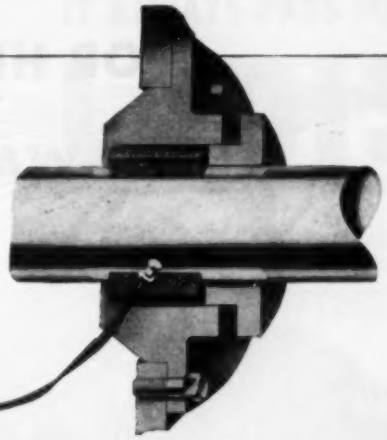
Carpenter

STAINLESS TUBING & PIPE — Analysis — Tolerance — Finish

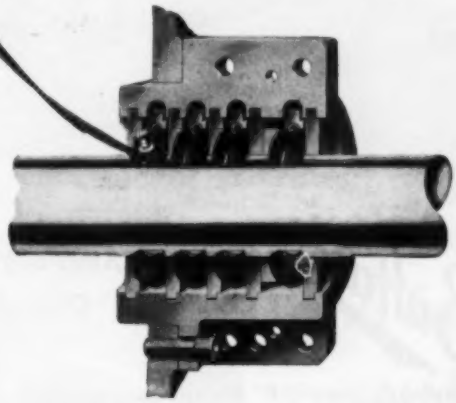
- guaranteed on every shipment

COPPUS TURBINES

offer you a choice of packing rings



STANDARD METALLIC RING PACKING — Made of high grade asbestos cores encased in specially treated lubricated aluminum foil. Recommended as a low-friction, long-service packing for steam temperatures up to 850 F and back pressures up to 50 lb. Adjustable packing glands keep leakage at minimum. Easy access to packing rings.



OPTIONAL CARBON RING PACKING — Consists of three carbon packing rings on the pressure side and one beyond the leak-off section. Each ring has three segments held together by a stainless steel garter spring. For back pressures up to 75 lb. Standard for vacuum or gas operation, or when leak-off is desired.

Heavy chrome plating on shaft at stuffing box is common to both types of Coppus packing.

Coppus Turbines ranging from 150 hp down to fractional in 6 frame sizes

FIT TURBINE COSTS TO HORSEPOWER NEEDS

When you buy turbines rated close to your exact horsepower needs, you save plenty of money. That's because turbines are generally priced in proportion to their size. The wide range of sizes of Coppus Turbines promises purchasing economy for you from the 150 hp size down to the smallest. As for operating and maintenance economies, you get them, too, from such other features as: greater number of manually operated valves for individual control of steam nozzles; replaceable cartridge-type bearing housings and others. For complete details . . .

WRITE FOR BULLETIN 135
COPPUS ENGINEERING CORPORATION
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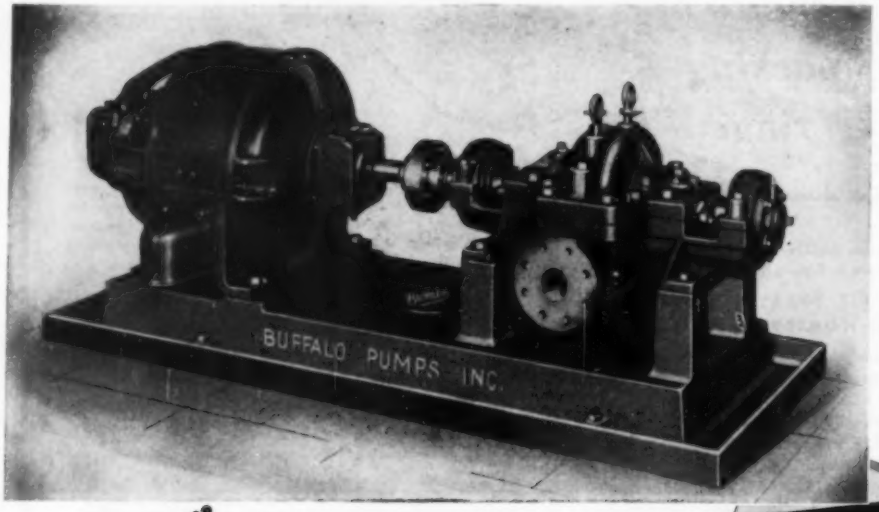
Sales offices in
THOMAS' REGISTER

COPPUS "BLUE RIBBON" TURBINES

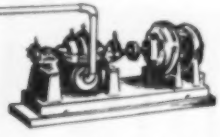
FOR HIGH PRESSURE CLEAR WATER PUMPING



"Buffalo"

2-STAGE AND 4-STAGE CLASS "RR" PUMPS

"Buffalo" Class "RR" Pumps are adequately built for the severe service of handling hot or chilled clear water at high heads, with exceptionally high efficiency. Practically no maintenance problem—modest power requirements—rugged endurance on the job—are what you get in "RR" Pumps. You will find all engineering details in BULLETIN 980-B. Write for your copy.



- Capacities Up To 900 gpm.
- For Heads Up To 1500'
- For Clear Water, Any Temperature

"Buffalo" PUMPS

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A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

IT ALWAYS PAYS TO SPECIFY

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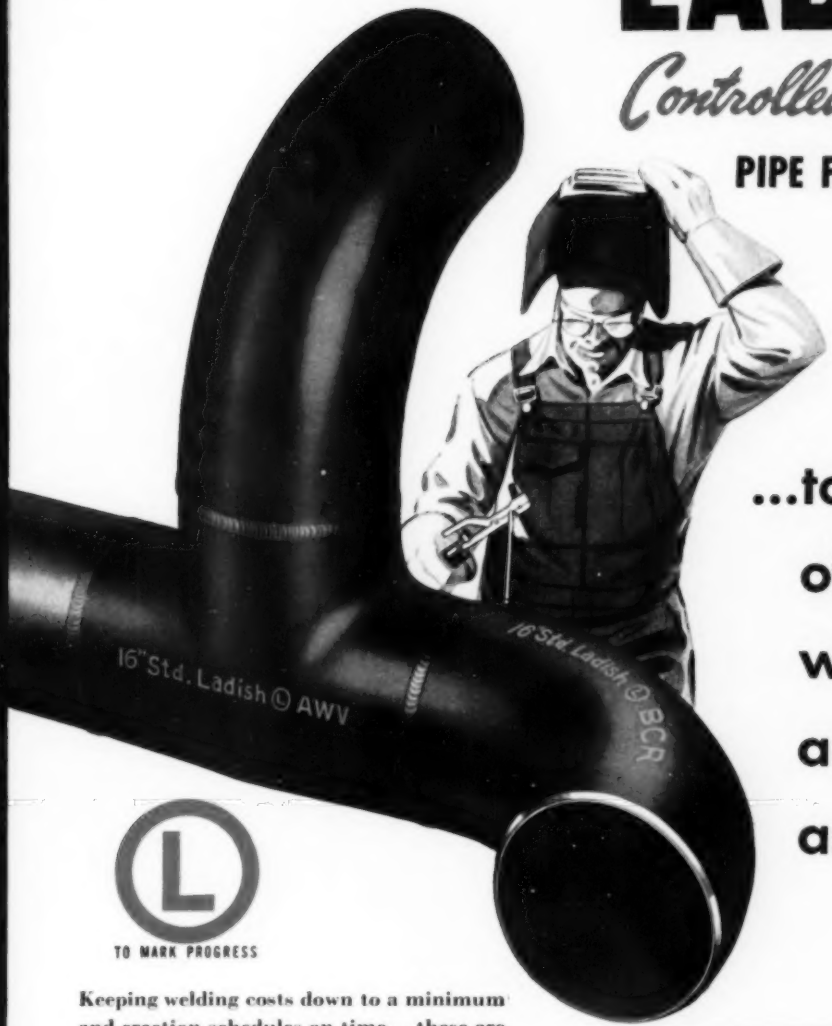
Controlled Quality

PIPE FITTINGS



...to be sure of sound welds and fast assembly

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TO MARK PROGRESS

Keeping welding costs down to a minimum and erection schedules on time... these are important advantages you can assure to any piping job by installing Ladish Controlled Quality fittings. Metallurgical controls over materials and methods provide an assurance of uniform weldability in every Ladish fitting... and thorough inspection to rigid standards of physical dimensions and geometric accuracy assures fast piping assembly.

THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED UNDER ONE ROOF...ONE RESPONSIBILITY

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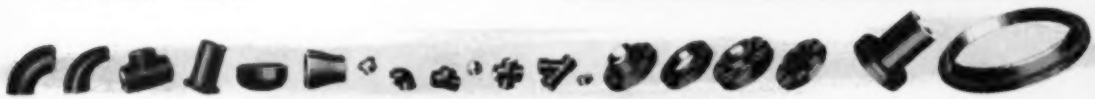
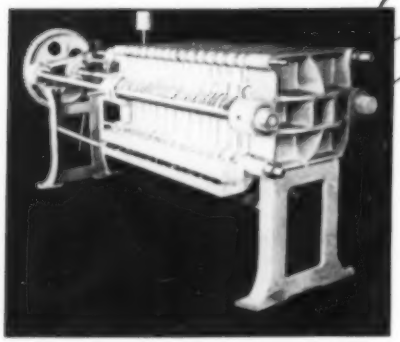


it's a tradition



AND QUALITY IS A TRADITION WITH THE SPERRY FILTER PRESS!

Sperry has pioneered and developed the Filter press that today ranks as America's most widely used filter. This definite acceptance of Sperry engineering reflects the *tradition of quality* that for over a half century has set the standard for all Sperry equipment . . . as exemplified in these advantages of the Sperry Filter Press:

Greater Flexibility: Handles any kind of filterable mixture . . . requires less floor space . . . operates on low, medium or high pressure . . . can handle hot liquids without vaporizing . . . Uses filter paper or pulp, wire, wool, asbestos, glass, vinyon and other kinds of simple filter cloths.

Greater Performance: Produces maximum clarity . . . makes the driest cakes . . . can separate emulsions . . . delivers filtrate to higher level than filter . . . leak proof construction . . . can deliver cake in slab form . . . thoroughly washes the cake.

Greater Economy: Low first cost . . . low upkeep . . . low installation cost . . . low depreciation . . . long life.

For specific data regarding your own filtration problem, consult Sperry. Send samples of your material for test run.

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All types . . . all sizes. Plain or punched to your specifications. Besides cotton and paper, bases are furnished in wool, synthetics, glass and woven metals.

D. R. SPERRY & COMPANY

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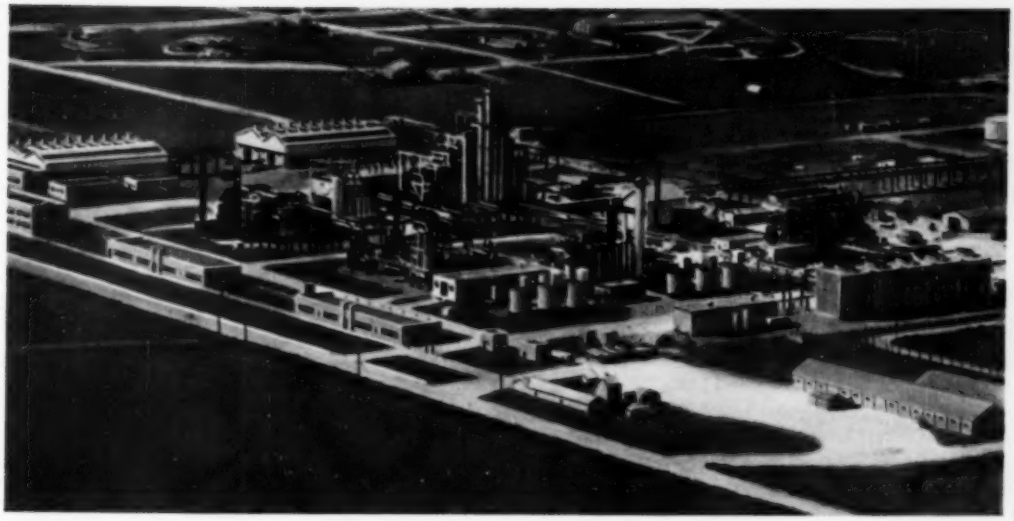
SPERRY FILTER PRESSES



Overall View showing new facilities . . Ethylene Plant, Ethanol Plant and Isopropanol Plant

THE GIANT *of* GRANGEMOUTH

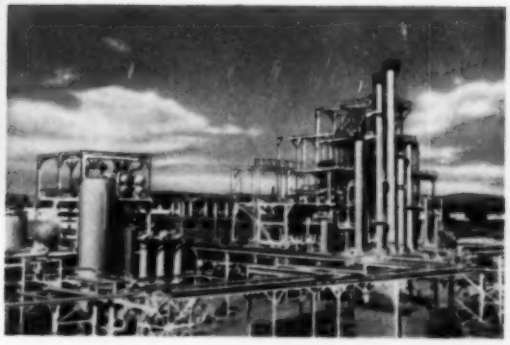
The British Petroleum Chemicals Ltd. plant at Grangemouth, Scotland, will supply the British Isles with a diversified line of important industrial chemicals and chemical intermediates derived from a crude petroleum stock. It was designed by Stone & Webster Engineering Corporation and built under the supervision of E. B. Badger & Sons Co. (Great Britain) Ltd.

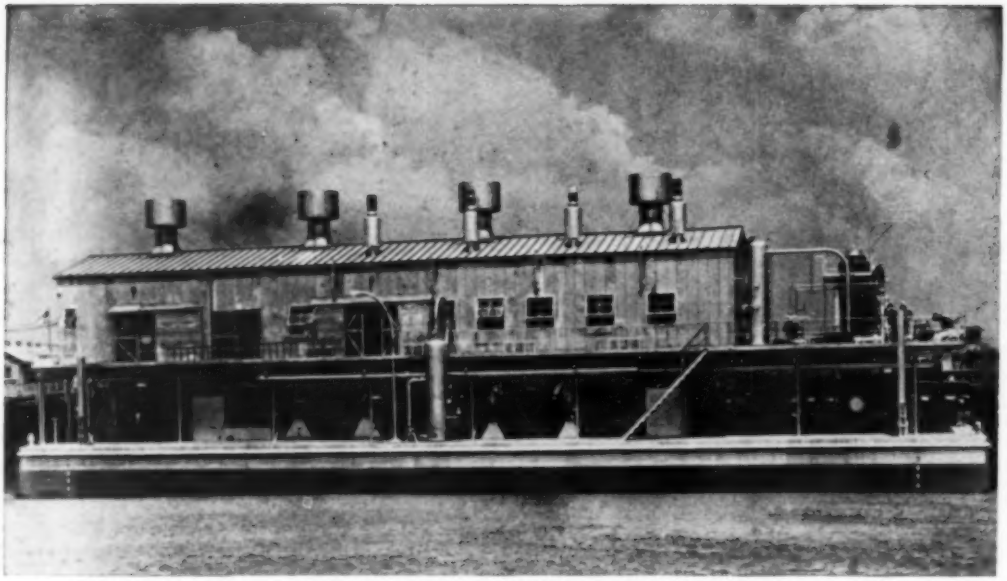
STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.

Compressor House — Interior

ETHYLENE PLANT
Cracking and Fractionating Structures





Developed by Bethlehem and Gulf Refining Company engineers, the first completely integrated Submersible Compressor Barge was built by Bethlehem's Beaumont Yard.

Bethlehem's Submersible Compressor Barge

For the Most Economical Working of Low Pressure Natural Gas in Shallow Water or Marshland

Length, 128 ft Width, 36 ft Depth, 10 ft

Five 300 hp Compressors

Daily Capacity 15,000,000 cu ft at 800 psi pressure.

- ★ Completely Integrated . . . Ready to Hook up to the Well.
- ★ Eliminates Need for Costly Erection Crews Miles from their Base.
- ★ Eliminates Need for Expensive Pile and Concrete Platforms.
- ★ Mobility, if and when Necessary.
- ★ 100 Per Cent Salvage.

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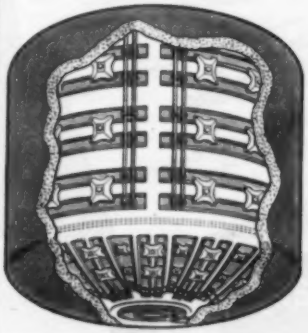
Easy to Install CHROMALOX Electric Strip Heaters give clean, dependable and accurately controlled heat where and when heat is needed. They produce uniform and accurate temperatures by automatic or manual controls. Low initial costs, low installation costs and low operating costs are among the many advantages of using CHROMALOX Strip Heaters for heating liquids, gases, viscous fluids, tanks, platens, molds, moving parts, etc. Get the full details now.

A Typical Strip Heater Application from Our Files



Rugged, easily installed Chromalox Strip Heaters assure accurate temperature, dependable around-the-clock service.

Strip Heaters curved slightly as installed conform to shape of convex kettle bottom, while . . .

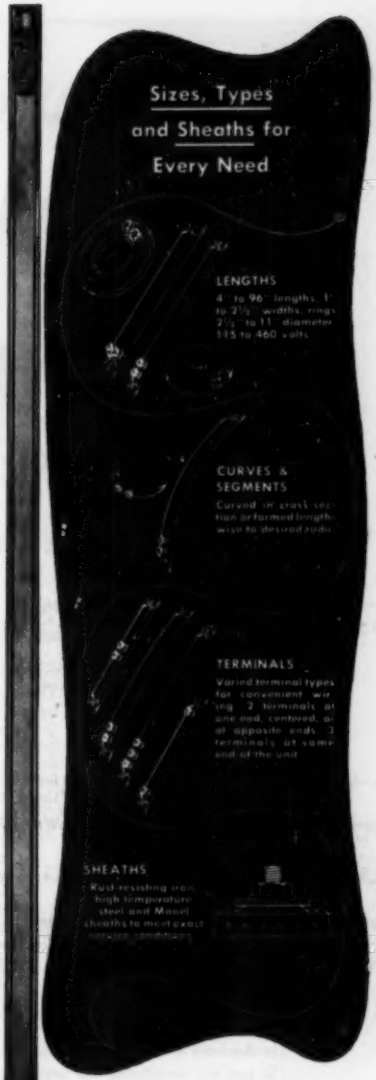
Strip Heaters curved lengthwise at the factory fit snugly to tank perimeter and . . .

Segment Heaters fill the gaps.

IC-99

CHROMALOX

Electric Heat for Modern Industry


Sizes, Types and Sheaths for Every Need
LENGTHS
4" to 96" lengths, 1" to 2½" widths, rings 2½" to 11" diameter 115 to 460 volts
CURVES & SEGMENTS
Curved or cross-section or formed lengthwise to desired radii
TERMINALS
Varied terminal types for convenient wiring. 2 terminals at one end, centered, or at opposite ends. 3 terminals at same end of the unit
SHEATHS
Rust-resisting iron, high temperature steel and Monel sheaths to meet exact corrosion conditions

Want Ideas?

on how to use Chromalox Electric Heaters in your plant

Write for the data-packed Catalog 50 which describes many types of Chromalox Electric Heaters and how to apply them. It's yours without obligation.

EDWIN L. WIEGAND COMPANY
7314 Thomas Blvd., Pittsburgh 8, Pa.

Diamond Alkali Company
CLEVELAND

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

B. F. GOODRICH CHEMICAL COMPANY
A DIVISION OF THE B. F. GOODRICH COMPANY
ROSE BUILDING
CLEVELAND 15, OHIO

LION OIL COMPANY
EL DORADO, ARKANSAS

MATHIESON CHEMICAL CORPORATION
MATHIESON BUILDING
BALTIMORE 3, MD.

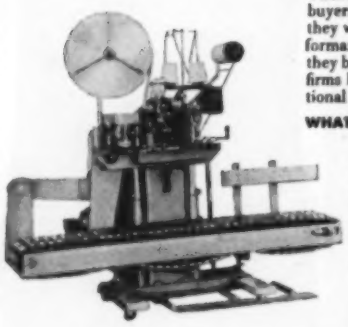
Spencer Chemical Company

THE SOLVAY PROCESS DIVISION
ALLIED CHEMICAL & DYE CORPORATION
SYRACUSE 1, NEW YORK

Wyandotte
WYANDOTTE CHEMICALS CORPORATION

YOU'LL KNOW THE Bagpaker®

BY THE COMPANIES IT KEEPS



These companies are *repeat* buyers of Bagpakers. Because they were pleased with the performance of the first Bagpakers they bought, every one of these firms bought one or more additional Bagpakers!

WHAT IS THE SECRET? First, superior design and construction provide efficient, economical and trouble-free operation. Second, BAGPAK SERVICE assures *continued operating efficiency.*

That's why Bagpakers pay for themselves in a hurry—and then keep right on paying bonuses in the form of better, more economical operation.

If you are considering the purchase of a new bag closing machine, then be sure to investigate the Bagpakers. Write today—ask for booklet No. 270E.

International Paper Company

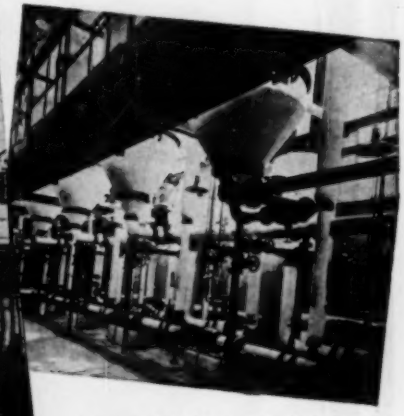
BAGPAK DIVISION

220 East 42nd St., New York 17

BRANCH OFFICES: Atlanta • Baltimore • Baxter Springs, Kansas • Boston • Chicago • Cleveland • Denver • Los Angeles • New Orleans • Philadelphia • Pittsburgh • St. Louis • San Francisco.
IN CANADA: The Continental Paper Products, Ltd., Montreal, Ottawa

Looking for evaporator pumps?

Worthite pumps handling distillery slop.



A battery of Worthites pumping black liquor in a soda pulp plant.

You can get the best in Worthington Worthite Centrifugal Pumps

By standardizing on a complete range of sizes in one superior stainless steel, Worthington can concentrate its volume and inventories. This means you can get the centrifugal pump and parts you need for handling corrosive liquids and other chemicals. Thousands of these Worthington *standard* pumps are now in evaporator service, pumping such widely varying liquids as black liquor, ammonium sulfate and frozen orange concentrate. Their advanced design and exceptional resistance to abrasion and corrosion assure best results at lowest operating cost.

FOR ALL EVAPORATOR SERVICES

Worthington has evolved a scientific method of selecting exactly the right pump for size, speed, head, capacity and NPSH. Let us show you how it works. For further facts proving *there's more worth in Worthington*, call your nearest District Office. Or write to *Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, N. J.*

TYPICAL LEADING MANUFACTURERS OF EVAPORATOR SYSTEMS USING WORTHITE PUMPS

Buflovak • General American Transportation
Gaslin Birmingham • Koppers
Majonnier Brothers • Struthers Wells
Swenson • Wilputte • Zaremba

WORTHINGTON

C1-1

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

Types CO and COL. Sizes ½" to 10". Capacities to 3000 GPM; heads to 200 ft. Liquid ends of WORTHITE alloy.

Type CF. Sizes 1" to 4". Capacities to 1000 GPM; heads to 130 ft. Standard, all iron and all bronze.

Type CQ. Sizes 1½" to 3". Capacities to 600 GPM; heads to 130 ft. at 1750 RPM. Closed impeller. WORTHITE shaft and fittings.

Type L. Sizes 2" to 8". Capacities to 2250 GPM; heads to 300 ft. Single stage volute. For general service.

R-S valvEvents

• EXCERPTS FROM THE R-S BOOK OF EXPERIENCE •

RUGGED Simplicity

Correctly engineered mechanically and metallurgically, all body assemblies of R-S Valves equal or exceed A. S. A. standards in every detail. These valves are designed and constructed for rugged service and provided with such safety factors that they will exceed service expectations as well as reduce pumping and blower costs.

Consider also the few working parts, greater control rangeability, the self-cleaning feature and the fact that R-S Valves are readily adapted to automatic operation. Know the rugged simplicity of R-S Valves, and get the most from your valve investment.

District offices are listed in telephone directories as, "R-S Products Corp'n Valves".

R-S PRODUCTS CORPORATION
4600 Germantown Avenue, Philadelphia 44, Pa.
An S. Morgan Smith Company Subsidiary

R-S VALVES
Simplify the Control
and Shut-off
of Volume and Pressure
from 2 to 2300 psig
Write for catalogs 17 and 18

No. 739-740—Sixty-inch, 50-pound Heavy Duty Valve with gear reduction drive and handwheel for handling water at 40 psig. Vertical valve stem enclosed in steel pipe support. Thrust bearing absorbs vertical load.

No. 730—R-S Heavy Duty Floor Stand for rugged service in connection with any standard R-S handwheel operated valve.

No. 767—A 3-Way Valve (Two 24-inch 125-pound Cast Iron Valves bolted to 125-pound American Standard Tee). Electric motor operated by cross linkage. Automatic declutching handwheel for emergency operation.

engineers who design for long life specify TRENTWELD

Here are 7 reasons why TRENTWELD is better

1. Largest variety of sizes—4½" to 30" inclusive
2. Finished tubing... machine-formed, machine-welded, machine-sized for uniformity
3. Made in a *tube* mill by *tube* experts
4. Made from tested cold rolled sheets ... completely fused into finished tubing *without* added rod metal
5. No zone of weakness for corrosion to attack
6. Uniform section, metallurgically correct
7. Available for fabrication with any fittings

Trentweld Large Diameter (4½" to 30") Stainless Steel Tubing should not be compared to rolled up and hand welded sheets: Trentweld tubing is machine formed and machine welded without metal added. The weld is fused to the parent metal by an exclusive Trent development. That's what makes the difference, and that's why more and more fabricators, designers and manufacturers of all types of processing equipment are turning to Trent for their tubing requirements.

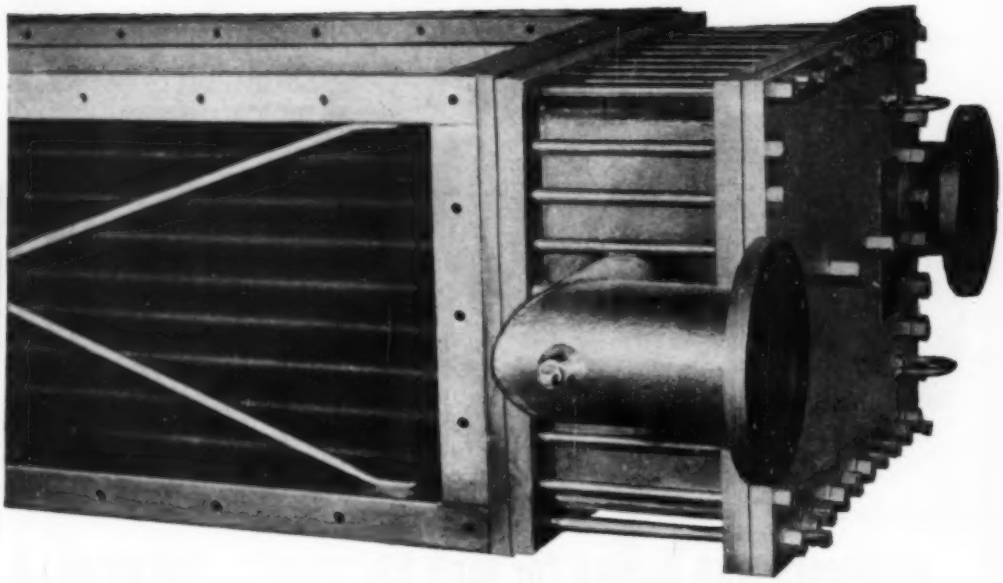
When you do business with Trent, you get top quality tubing PLUS engineering assistance to put stainless tubing to work in your application ... better! Write for Trentweld Data Bulletin and tell us the application you have in mind.

TRENTWELD STAINLESS STEEL TUBING

TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST TROY, WISCONSIN

(Subsidiary of Crucible Steel Company of America)

TO COOL OR HEAT AIR OR GAS ....*EFFICIENTLY*



G-R K-Fin Units are admirably suited for air and gas cooling and heating duties. The use of K-Fin Elements with mechanically bonded helical fins, requiring no tinning, enables these units to withstand high temperatures and to operate successfully on duties where loosening of fins cannot be tolerated.

One of the distinctive features of the G-R K-Fin Cooler is its cooling surface of superior effectiveness. The K-Fin elements of this unit have helical fins. These fins, forming an extended outside tube surface, provide a higher heat transfer rate for a given air or gas pressure drop than is obtainable with other finned tube coolers.

When used as a *generator air cooler*, the K-Fin unit is embodied in a self-contained, closed, dust-proof and fireproof system, using turbine condensate or other available water supply as the cooling medium.

Some of the many other applications of this unit are for recovering gases from solvents, dehydrating illuminating gas, cooling gases from annealing ovens, and other gas cooling services.

Write for Bulletin describing all the features of the K-Fin Air and Gas Cooler.

THE GRISCOM-RUSSELL CO., MASSILLON, OHIO

GRISCOM-RUSSELL

PIONEERS IN HEAT TRANSFER APPARATUS

Cleaver-Brooks Compression Distillation . . . The Most Economical Method of Evaporation

Here's Why:

The table shows the approximate costs of operation per 1000 gals. of evaporated water with a Cleaver-Brooks Compression Evaporator as compared with standard multi-effect steam evaporators.

OPERATING DATA	STEAM EVAPORATORS					Cleaver-Brooks Compression Evaporation
	Single Effect	Double Effect	Triple Effect	Quadruple Effect	Quintuple Effect	
Pounds water evaporated per pound steam input from boiler	0.9	1.75	2.5	3.2	4.0	———
Pounds steam required per 1000 gallons water evaporated	9250	4750	3325	2600	2070	200
Gallons condenser water required per 1000 gallons water evaporated	33,300	16,650	11,100	8,325	6,650	none
Steam cost per 1000 gallons water evaporated, based on steam at $.80 per 1000 pounds	$7.40	$3.80	$2.66	$2.08	$1.66	$.16
Condenser water cost per 1000 gallons water evaporated based on water at $.10 per 1000 gallons	$3.33	$1.66	$1.11	$0.83	$0.66	none
Electric Power Consumption per 1000 gallons water evaporated	10 KWH	6 KWH	6 KWH	6 KWH	6 KWH	60 KWH
Electric Power cost per 1000 gallons water evaporated based on power @ $.01 per KWH	$.10	$.06	$.06	$.06	$.06	$0.60
Total Water & Energy cost per 1000 gallons water evaporated	$10.83	$5.52	$3.83	$2.97	$2.38	$0.76

The concentrating of chemical solutions for valuable recovery or for disposal can be done economically with compression distillation.

The recovery of pickling liquors, the concentration of waste proteins, the concentration of waste pulp liquors, are just a few of the process problems which can be solved through vapor compression distillation at less cost.

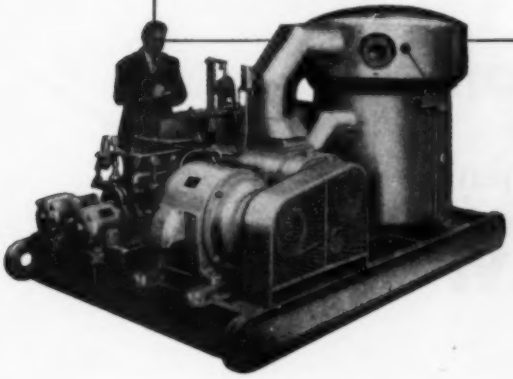
Cleaver-Brooks is constantly called upon to evaluate chemical process problems in terms of the vapor compression cycle.

After a complete analysis of your process problem, a Cleaver-Brooks compression still is constructed to meet your specific needs. Complete consideration is given to the type of raw liquid to be evaporated, the capacities of your allied equipment, the future growth of your plant operations, and the use or uses of the products to be distilled or concentrated.

It will pay you to consider now the value of compression distillation in your plant for purification or recovery or disposal.

Write for bulletin:
"Compression Distillation"

Cleaver-Brooks Company
381 JE Keefe Avenue
Milwaukee 12, Wisconsin



Consider Compression Distillation for Purification... Recovery... Disposal

Cleaver-Brooks

Builders of equipment for the generation and utilization of heat.

A digester being radiographed with two-million-volt X-ray equipment
QUALITY
BY THE TON
... process equipment by
B&W

Today, fabricating capacity and mechanical design facilities alone cannot provide an adequate solution to the equipment problems imposed by modern processing temperatures, pressures, and stepped-up cycles of operation.

Design and construction of vessels and heat-transfer equipment necessarily involve such relatively new research data as creep characteristics and the metallurgy and methods of welding dissimilar metals and alloys. B&W is particularly well equipped . . . both by research and experience . . . for the proper selection of materials, their fabrication, and integrated assembly to meet the special requirements of modern chemical, petroleum, and food processing.

No matter how "big" you buy, you can still think in terms of *quality* — fine engineering, conscientious craftsmanship, experience, and the ultimate in critical inspection — when B&W contracts for the job. The Babcock & Wilcox Company, 85 Liberty Street, New York 6, N. Y.

Quality material and workmanship are required for high alloys that operate at severely high temperatures

BABCOCK & WILCOX

S-4067

FEED

WEIGH AND FEED

CONVEY

PACK

COOL

DRY

SCREEN

Jeffrey-Traylor Direct-type DRYER—furnished with either perforated or louvered conveying surface through which drying or cooling air or gases are passed. As solid material is conveyed over surface, each particle is continuously and completely surrounded with a stream of air or gas of correct temperature and condition.

COOLING OR DRYING

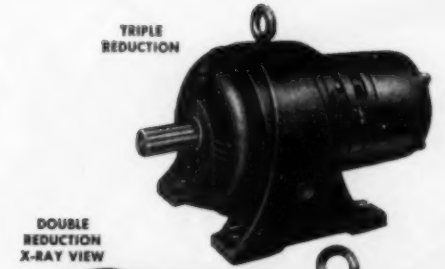
CUSTOM-BUILT SYSTEMS *Engineered to meet your need*

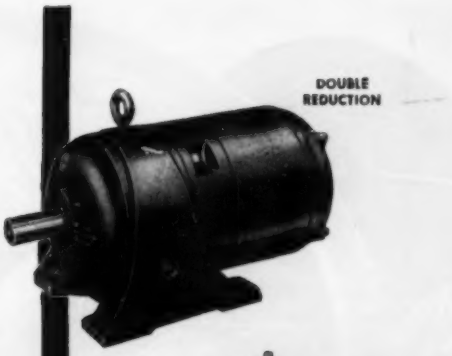
It looks BIG . . is BIG . . does a BIG job. It's the Jeffrey-Traylor Dryer for granular materials. Made in standard-unit lengths, each independently powered. Sections can be arranged in exactly right combination for any operation—and they work together. Conveying action by electric vibration. No contamination of material—no breakage—no loss of color or luster. Specially valuable for processing under closely-controlled conditions. Can be used for cooling as well as drying. Catalog No. 804 tells all. Send for it.

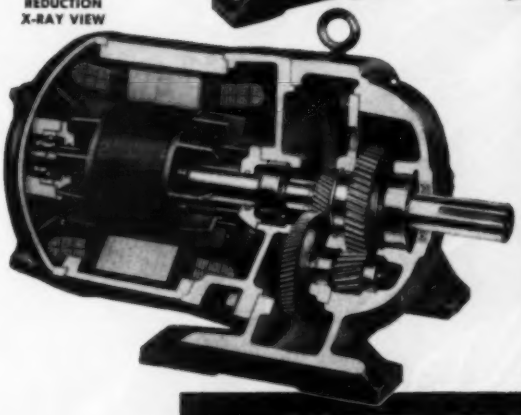
THE JEFFREY MANUFACTURING COMPANY ESTABLISHED 1877

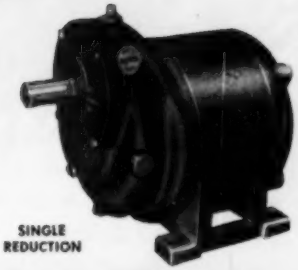
909 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment









FOOTE BROS.-LOUIS ALLIS GEARMOTORS

PROMPT DELIVERY!

Would prompt delivery of Gearmotors solve your problem?

If you're up against costly delay, then keep in mind that you can count on prompt delivery of Foote Bros.-Louis Allis Gearmotors.

Foote Bros. offer the finest Gearmotor obtainable. A Gearmotor of superior design and construction—produced jointly by Foote Bros. and Louis Allis—both leaders in their respective fields.

Foote Bros.-Louis Allis Gearmotors are available in single, double and triple reductions to provide output speeds of 780 down to 7.5 r.p.m. Capacities from 1 h.p. through 150 h.p. Open drip-proof, splash-proof, enclosed and explosion-proof motors.

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GEAR AND MACHINE CORPORATION
Dept. CE, 4545 South Western Blvd., Chicago 9, Ill.

- **Duti-Rated Gears—file hard tooth surfaces—resilient cores.**
- **Tang driven motor shaft pinion positively positioned.**
- **Extra capacity ball or tapered roller bearings.**
- **Cast iron housing for maximum rigidity under load. Large oil reservoir, splash lubrication.**
- **Leakproof oil seals.**
- **Dynamically balanced die-cast aluminum rotor. Impregnated windings assure protection from moisture, dust, and oil.**
- **Ball bearing motor for trouble-free operation.**

FOOTE BROS.
Better Power Transmission Through Better Gears

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Foote Bros. Gear and Machine Corporation
Dept. CE, 4545 So. Western Blvd.
Chicago 9, Ill.

Send me Bulletin GMA on Foote Bros.-Louis Allis Gearmotors.

Name.....
Company.....
Position.....
Company Address.....
City.....*Zone*.....*State*.....

A WORD TO Chemical Shippers from North American

Today's zooming production has created demands for North American specialized tank cars that far exceed supply. To help meet these expanded requirements, North American is working hard to keep all tank cars rolling every minute possible . . . striving hard for maximum availability in order to better serve shippers from coast to coast. And, as always, North American stands ready to apply 43 years' transportation experience to any shipping problem of the chemical industry.

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SHELL [illegible], ST. [illegible], MO.
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60 EAST 42ND STREET, NEW YORK 17, N. Y.
91 SOUTH MAIN STREET, FOND DU LAC, WIS.
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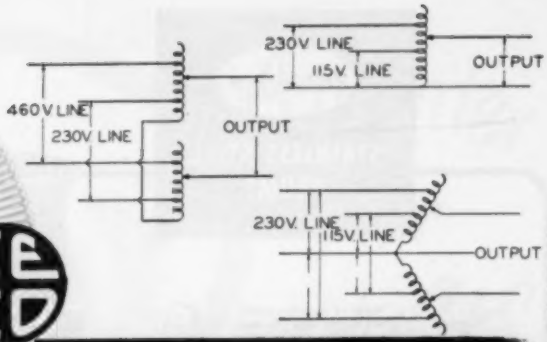
NORTH AMERICAN CAR CORPORATION

NORTH WESTERN REFRIGERATOR LINE COMPANY

231 South LaSalle Street, Chicago 4, Illinois

A nationwide organization with branch offices in important market centers

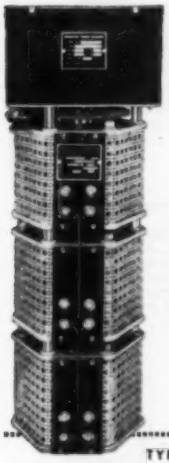
POWERSTAT VARIABLE TRANSFORMERS



A TYPE FOR EACH APPLICATION

TYPE 20

TYPE 116



TYPE MZ1126-3Y

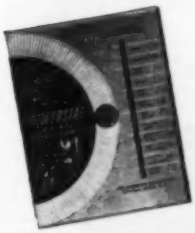
TYPE 2PF1126

A COMPLETE LINE of standard manually-operated and motor-driven POWERSTAT variable transformers are available for 115, 230 and 460 volts, 50/60 cycles, single and three phase service in ratings from 405 VA to 100 KVA in air-cooled, oil-cooled and explosion-proof models. Non-catalogued assemblies are offered for 25, 400/800 cycles and higher frequency operation and for requirements involving J.A.N. specifications.

SUPERIOR PERFORMANCE is inherent in every POWERSTAT variable transformer. Each unit possesses excellent regulation, high efficiency, conservative rating, zero waveform distortion, rugged mechanical construction, smooth control and simplified mounting.

ONE SOURCE, The Superior Electric Company can provide the answer to your variable a-c voltage problem. Superior offers more combinations of connections and ratings for variable a-c voltage control than any other manufacturer. Look to Superior first.

THE SUPERIOR ELECTRIC CO.
BRISTOL, CONNECTICUT



GET THE FACTS

16-page POWERSTAT Bulletin P550, complete with application and design information, ratings, diagrams and dimensions.

209 CHURCH STREET, BRISTOL, CONNECTICUT

SEND ME Bulletin P550 on POWERSTAT Variable Transformers.

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CO. ADDRESS_____

CITY_____ ZONE_____ STATE_____

MANUFACTURERS OF

POWERSTAT VARIABLE TRANSFORMERS • VOLTBOX A-C POWER SUPPLIES • STABILINE AUTOMATIC VOLTAGE REGULATORS
VARICELL D-C POWER SUPPLIES • 5-WAY BINDING POSTS • POWERSTAT LIGHT DIMMING EQUIPMENT

Hackney
MILWAUKEE

STAINLESS STEEL DRUMS

"Absolutely liquid-tight—no chance for leakage in or out."
"They're exceptionally lightweight—easy to handle. Yet they're strong, too!"
"Made of stainless steel! That means long life and utmost resistance to corrosion—very attractive appearance."
"Look inside—no chime crevices! There's no place for foreign matter to lodge."
"Head is completely removable. Emptying and cleaning are easy. Your choice of two types of closures—the famous quick-acting Toggle-tite or bolt type."
"And look at the specially formed Hackney welded chime construction. That's what insures a smooth bottom . . . so easy to clean and keep clean."

TO YOU...

THESE FEATURES MEAN YEARS OF LOW-COST SERVICE!

No wonder shippers say Hackney Stainless Steel Drums can't be excelled for shipping many chemicals and foods! They like them, too, because they're returnable containers—will keep giving their low-cost advantages year after year.

Perhaps your shipping and storage facilities could profit by the use of Hackney Stainless Steel Drums. They are also available in mild steel, plain, galvanized or tinned. Write for full details.

Another Important Hackney Product

HACKNEY REMOVABLE HEAD SEAMLESS ALUMINUM BILGED BARRELS

These Hackney aluminum barrels are ideal containers for many types of products—foods, chemicals, etc. They are lightweight, sturdy and economical. Also available in mild steel.

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Manufacturer of Hackney Products

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Hackney
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CONTAINERS FOR GASES, LIQUIDS AND SOLIDS

ENJAY

*Trade-Mark

A pointer for products

sells an extensive line of oxygenated solvents and chemicals

Every day more industries are buying Enjay chemicals. Industrial users know that the solvents and chemicals sold under the ENJAY* Oval Trade-mark are famous for high-quality and dependability.

EXPERIENCED

RELIABLE

DIVERSIFIED

ENJAY markets this wide range of industrial chemicals:

Petrohol 91 (Isopropyl Alcohol)	Methyl Ethyl Ketone	Aromatic Tars
Petrohol 95 (Isopropyl Alcohol)	Ethyl Ether	Paratone
Petrohol 99 (Isopropyl Alcohol)	Isopropyl Ether	Parapoid
Secondary Butyl Alcohol	Diisobutylene	Paratac
Isooctyl Alcohol	Polypropylenes	Paranox
Isopropyl Acetate	Butadiene	Paraflow
Secondary Butyl Acetate	Isoprene	Vistanex
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ENJAY products are marketed in bulk or in quantities to fit your requirements.

ENJAY COMPANY, INC.
15 W. 51st St., New York 19, N. Y.

PROBLEM...

. . . concrete for highways, that will withstand the destructive effects of freezing weather.

SOLUTION...

. . . cement made with Vinsol . . . a low-cost, readily available Hercules resin. When added to Portland cement in minute quantities, neutralized Vinsol makes concrete that's filled with tiny bubbles of air. This entrained air serves as an internal "cushion" against alternate freezing and thawing . . . prevents damage to the pavement.

Vinsol® Paves The Way

RESULT...

. . . longer-lasting concrete roads that cost less to maintain. Air-entrained concrete also is easier to handle, stays mixed, does not settle out. Today, the use of Vinsol far exceeds that of all other air-entraining agents combined. Notable jobs for which air-entrained concrete was specified recently include the new Delaware Memorial Bridge. More than 6,000,000 cubic yards will go into Hungry Horse, Bull Shoals, and Clark Hill dams.

Vinsol paves the way to product improvements or economies in many industries. In plastics, this readily available resin is used as a modifier or extender for phenolics and other resins—in paper laminates, in thermoplastic compositions, as a binder for rock wool and glass wool bats, and as a component in phonograph records. It stiffens paperboard and leather, has good electrical insulation properties, is useful in adhesive compositions, and is a money-saver in dark-colored protective coatings and printing inks. Write for technical information on Vinsol and a generous testing sample.

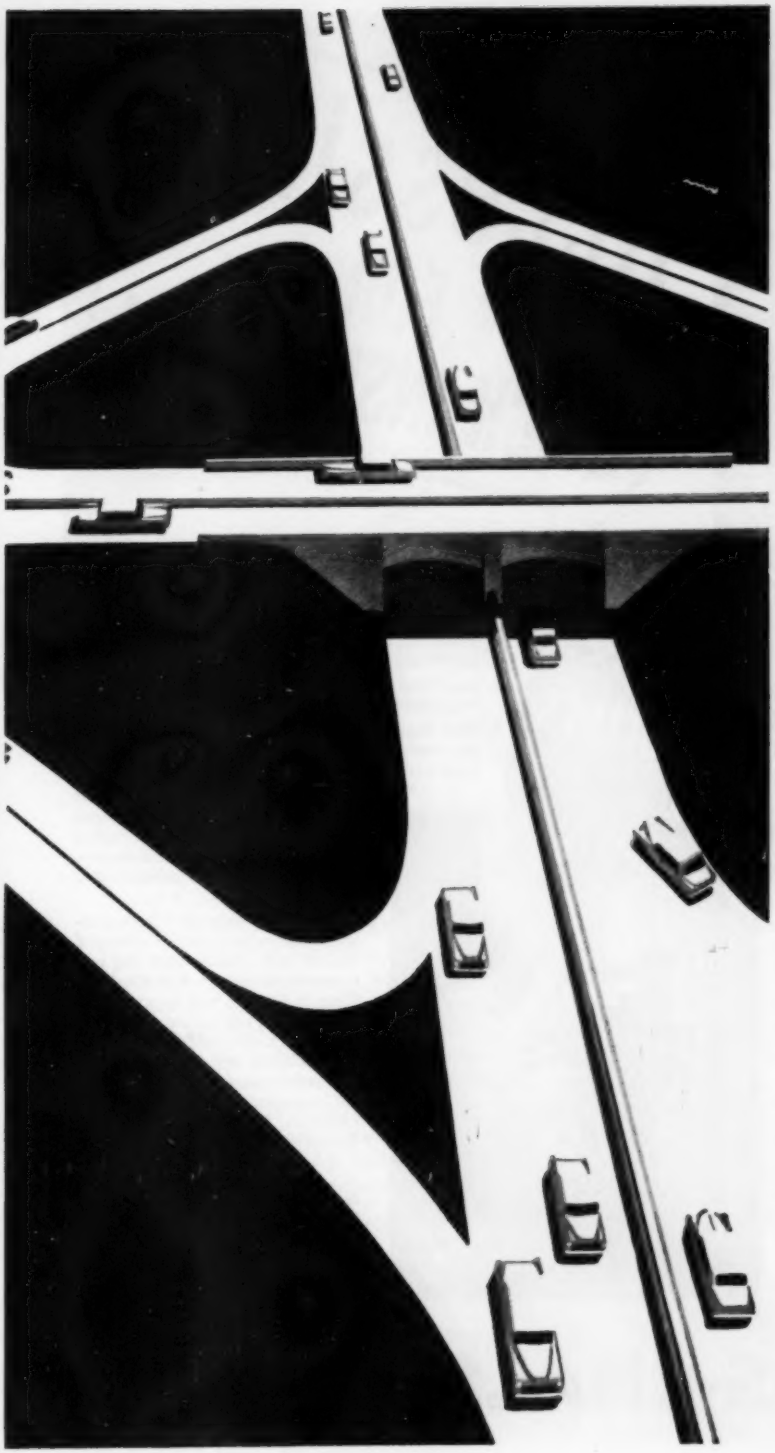
HERCULES POWDER COMPANY 952 *Market St., Wilmington, Delaware*

Sales offices in Principal Cities

HERCULES

SYNTHETIC RESINS—CELLULOSE PRODUCTS—TERPENE CHEMICALS—ROSIN AND ROSIN DERIVATIVES—CHLORINATED PRODUCTS—OTHER CHEMICAL MATERIALS FOR INDUSTRY

AE8



Growing Amine Family

An increasing number of useful products are being derived from Hercules Rosin Amine D. Although available now only in limited commercial quantities, these salts and derivatives are finding application in such widely diversified products as active fungicides, bactericides and algaecides, corrosion inhibitors, and flotation agents.

Among the salts and derivatives of Rosin Amine D now being supplied are the acetate, the naphtenate, and the stearate. When reacted with ethylene oxide, Hercules obtains certain polyethanols of rosin amine. Rosin Nitrile D, an intermediate in the manufacture of Rosin Amine D, is being produced on a limited commercial scale.

A new unit to expand commercial production of rosin amine and its derivatives will be located at Hercules' Hattiesburg, Mississippi, naval stores plant. The unit is expected to be in operation in the summer of 1952.

New Military Lacquer Spec.

A new military specification for lacquer is now issued and official. Identified as "Military Specification MIL-L-11195 (ORD) Lacquer, Lustreless, Hot Spray (For Ammunition)" the specification covers lacquer intended primarily as one-coat finishes for phosphated or primed shells, bombs, grenades, or other ammunition components.

This new specification provides the military establishments with a means whereby they can obtain the time-saving and cost-cutting advantages of high-grade lacquer applied by the hot-spray process in one coat, or can thin the lacquer for room temperature application, if this is more suitable.

New Resin Ready

Cellolyn® 106, Hercules' newest lacquer resin, is now available in quantity. It is a hard, rosin-based resin, markedly self-plasticizing, and is intended to replace both the hard resin and the oil in the average lacquer formulation.

This new resin combines some of the more useful characteristics of the rosin-based semi-alkyds with the well-known economy of the hard maleic resins. Cellolyn® 106 provides, on an economical basis, unusual flexibility, as measured by cold check resistance. It represents the most recent advance in lacquer resin chemistry, yet requires the minimum amount of certain critical materials.

GC51-5

Accessible FOR QUICK INSPECTION!

ALLIS-CHALMERS Type H Starter cubicles are divided into three main compartments to assure quick, easy and safe maintenance checks.

1. **High Voltage Fuse Compartment** — enclosed by an electrically interlocked door which disconnects the load when fuses are exposed.
2. **Low Voltage Compartment** — houses control relays and accessories . . . accessible through a 68" door.
3. **Rear High Voltage Compartment** — all high voltage components are accessible through the full length rear door.

ALLIS-CHALMERS
Type H Starters
FOR 2300 TO 5000 VOLT MOTORS

Contactors, overload relays, short circuit fuses . . . everything you need for complete control of your motors is readily accessible in the attractive, easy to install steel cabinet of a Type H Starter.

For full or reduced voltage starting, reversing or dynamic braking of squirrel-cage, wound rotor and synchronous motors . . . Allis-Chalmers Type H Starters will be your right answer. They are engineered for dependability, designed for ready access, and built to give long life with low maintenance. Call your nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin for bulletin 14B6410A. A-3249

MAXIMUM HORSEPOWER

	AIR CONTACTOR		OIL CONTACTOR	
2000-2500 VOLTS	Synchronous		Synchronous	
	1.0 PF	.8 PF	1.0 PF	.8 PF
	1500	1250	800	700
	Induction 1250		Induction 700	
4000-5000 VOLTS	Synchronous		Synchronous	
	1.0 PF	.8 PF	1.0 PF	.8 PF
	2500	2250	800	700
	Induction 2250		Induction 700	

Specify the Type 256 Air Break Contactor, shown in the starter at left, for tough, repetitive duty and long contact life . . . Type MO Oil Immersed Contactor for normal starting duty or for service in dust laden, corrosive or very moist atmospheres.

ALLIS-CHALMERS

Rolling Fabric Into Extra Profit

Take an attractive but inexpensive fabric or paper. Laminate to it a thin vinyl film. Then watch it sell like hot cakes . . . and at a premium. Essentially, that's the story behind one of America's fastest growing new product developments . . . one with wide potentialities still to be explored. Before commercial success could be achieved, machinery had to be devised for low-cost lamination and to provide fast switchover from one paper or fabric to another. Lukenweld developed 2 units, with driven jacketed stainless steel heating and cooling rolls mounted in an inexpensive welded plate frame. Today, similar machines are in wide use throughout the industry.

Maximum product dependability with minimum cost are the result of years of experience of Lukenweld engineers working with steel plate. Higher predictability, improved appearance, resistance to shock, reduced weight, increased strength and rigidity, more flexibility of machine design, reduced production costs and elimination of patterns usually result from the use of Lukenweld construction. Here at your disposal are Lukenweld's knowledge of machine design, construction, installation . . . plus Lukens 140 years' experience in developing and producing specialty steels.

If you are considering new cylinder drying machinery, processing machines or other finished units, write Lukenweld, Division of Lukens Steel Company, 400 Lukens Building, Coatesville, Pennsylvania.

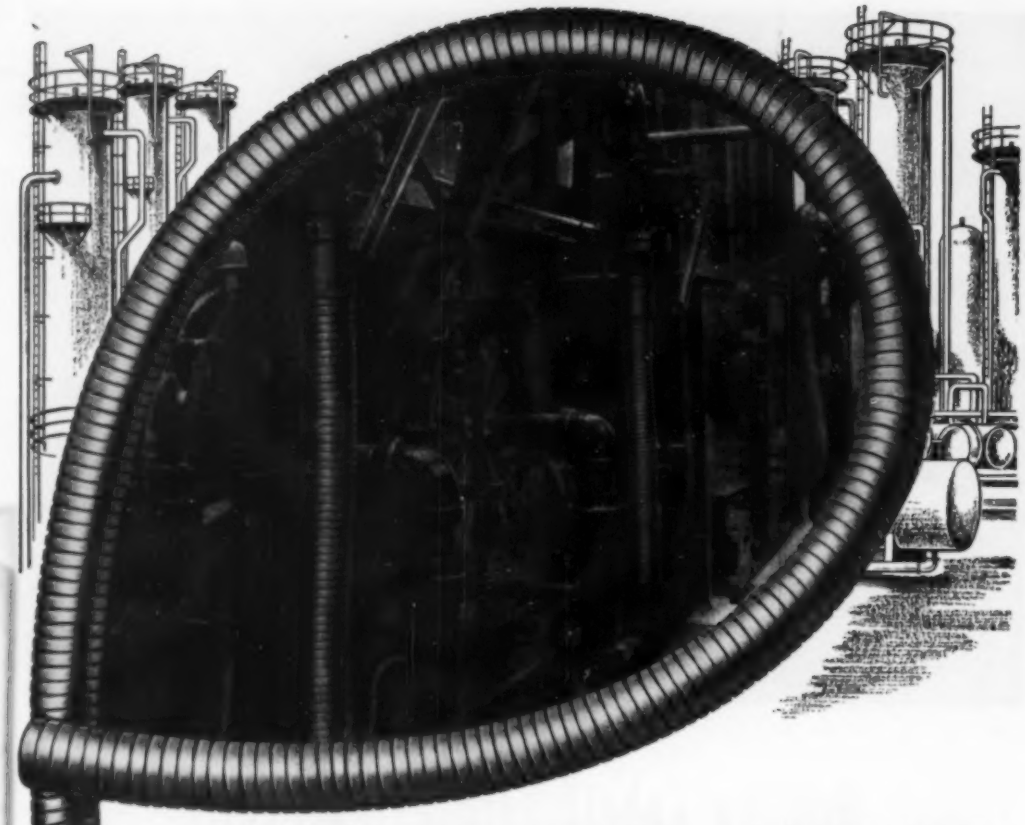
SPEED SALE OF YOUR SCRAP

Improved machinery for improved processes through engineering

LUKENWELD

A DIVISION OF LUKENS STEEL COMPANY

LUKENS



CORRUGATED "MUSCLES" THAT LET PIPES MOVE

PENFLEX METAL HOSE ABSORBS THERMAL EXPANSION . . . PREVENTS JOINT LEAKS

Petroleum still burners like this one in Kermit, Texas, put heavy strains on piping. Thermal expansion, contraction and physical shock make safe sealing of burner pipe joint assemblies a vital requirement.

Penflex flexible metal hose with couplings is used on these burners to absorb any pipe movement due to extreme temperature and pressure changes. Lengths of 4" I.D. interlocking, four-wall galvanized steel hose are installed on each burner. Provides outstanding safety and high, uninterrupted flow of volatile fluids. Leakproof, tough and *flexible*.

Penflex engineers can help you solve flexible tubing application problems. Penflex manufactures a complete line of four-wall, interlocking and seamless welded corrugated tubing . . . from ⅛" I.D. and up . . . automatic barrel fillers, accessories and fittings. Write for illustrated folder, "Flexineering," containing valuable flexible tubing data for your product application.

Pennsylvania Flexible Metallic Tubing Company, Inc., 7234 Powers Lane, Phila. 42, Pa.
Branch Sales Offices: **Boston • New York • Chicago • Houston • Cleveland • Los Angeles**

penflex

HEART OF INDUSTRY'S LIFE LINES

Stainless and High Alloy Castings

for severe chemical service

Special Stainless Valve Stand Casting

Corrosion, heat and abrasion are *not* serious problems...*for the chemical plant that uses ESCO cast stainless and high alloy equipment.*

Into these castings goes a combination of design and metallurgical experience, supported by complete facilities for casting and heat treatment. Non-destructive testing, including X-ray, gamma ray and Zyglo are used frequently to check the structure of castings and assure uniformly high quality.

Resulting equipment gives prolonged service under adverse operating conditions with a minimum of production interruptions.

ESCO Stainless and High Alloy Steels

ELECTRIC STEEL FOUNDRY

2143 N. W. 25th Avenue, Portland 10, Oregon

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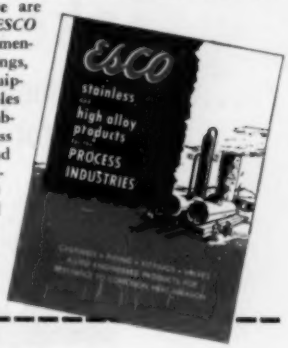
A NEW CATALOG FOR YOU!

Let us give you detailed facts of *ESCO* service. These are contained in our new catalog "*ESCO* Stainless and High Alloy Products". Included here are technical descriptions of *ESCO* alloys; illustrations and dimensions of *ESCO* pipe, fittings, valves and processing equipment; frequently used tables of weights of bars and tubing; temperature, hardness and metric conversions; and data on corrosion resistance of principal *ESCO* alloys to commonly used corrosive media. . . . Get your copy from nearest *ESCO* office, or fill in and mail the coupon.



ELECTRIC STEEL FOUNDRY
2143 N. W. 25th Avenue, Portland 10, Oregon

Please send me your new catalog, "ESCO Stainless and High Alloy Products".

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Company_____
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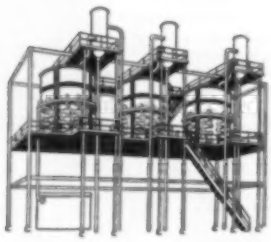
Take two

...when you move for acid recovery



NATIONAL LEAD COMPANY
Acid Recovery Department
111 Broadway, New York 6, N. Y.

What to do with spent sulphuric acid is a problem that has long plagued the chemical processing industry. Some plants have found acid recovery profitable, moneywise. Others have found reclamation advisable, community-wise. All agree that some solution is essential.

If you've decided to recover your spent acid, whatever the motivation, make the move to gain *two* desirable ends — one, acid efficiently concentrated for re-use; two, a recovery operation that is fumeless. A further consideration, obvious to large acid users, is the current need for conservation of sulphur.

The *Simonson-Mantius Vacuum Process* is the means to these ends. By recovering acid in closed vessels, *under vacuum*, this process not only reduces acid losses but also eliminates obnoxious fumes.

Simonson-Mantius equipment, designed and installed by our Acid Recovery Department, operates with low cost and high efficiency in all fields using sulphuric acid for processing. If you are seeking a realistic solution to a spent acid problem, our specialists can be genuinely helpful.

Century

Serves the Electric Motor User in Two Important Ways:

1. Century motors are designed and constructed for a long, dependable operating life.

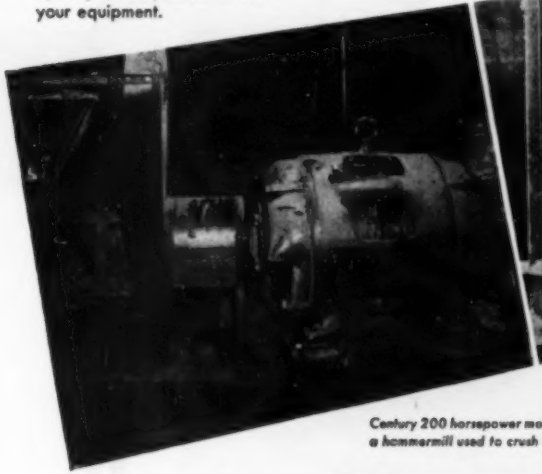
2. Just as important—they are skillfully selected to match the operating characteristics of the many kinds of equipment they drive.

IN CENTURY'S wide range of types and sizes (up to 400 H.P.) there are available: 4 standard classes of starting torque characteristics—6 methods of speed control—constant and short time ratings—4 basic classes of frame protection against atmospheric hazards—a dozen methods of mounting the motor to the equipment—plus many special specifications to meet the requirements of the BIG NAME equipment manufacturers who use Century motors as a component part of their equipment.

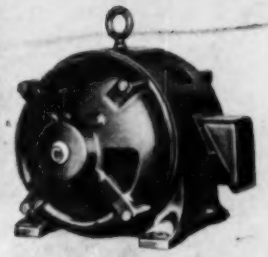
Teamwork with equipment producers gives you skillfully selected motors from Century's wide range of types and sizes... properly applied to match the performance characteristics of the machines they drive.

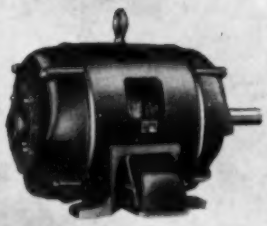
Both a properly designed and constructed motor, plus skillful application, are required to give you top performance and long life on the new ultra-modern production equipment.

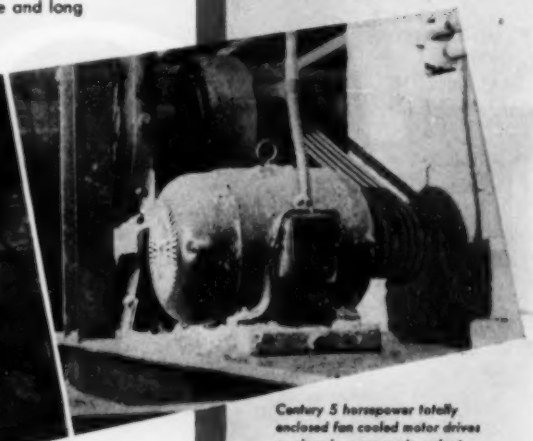
Specify Century motors on all your equipment.



Century 200 horsepower motor driving a hammermill used to crush feed.







Century 5 horsepower totally enclosed fan cooled motor drives a mixer in a processing plant.

Century Electric Company is celebrating its 50th year in the electrical industry

CENTURY ELECTRIC CO.
1806 Pine St. • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

Century SERVICE Is Near Any CENTURY Motor Driven Equipment

Prompt Service is offered by CENTURY'S National Network of more than 200 Authorized Service Stations, supervised by 28 Century Sales offices.

1. Facilities for immediate exchange of most CENTURY standard ratings of standard construction are available at CENTURY Authorized Service Stations.
2. CENTURY Authorized Service Stations are qualified and equipped to service and repair any piece of CENTURY apparatus.
3. Genuine CENTURY renewal parts are available at CENTURY Service Stations, CENTURY Parts Distributors and at the factory in St. Louis.

Century C MOTORS

designers . . .

THE BABCOCK & WILCOX TUBE COMPANY

***Executive Offices:* Beaver Falls, Pa.**

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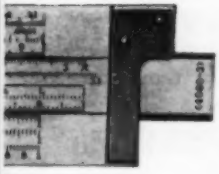
● **for long-term exposure at 650F. to 850F.**

take a **CLOSER LOOK** *at*

mechanical properties



In apparatus where tubing must withstand high internal pressures at elevated temperatures, *mechanical properties* of the tubing-steel are important determinants of wall-thickness and size.

Evidently, any lasting improvement in the physical properties of a given steel will allow the designer a greater latitude in the selection of tubing, with possible advantages in the reduction of weight and cost.

Croloys 2¼, 5, and 7 have long been popular in the fully annealed state for normal service conditions up to 1250 F. Now it is established by recent B&W tests that the *increased* mechanical strength obtained by normalizing and tempering these alloys is substantially unaffected by long-term exposure to temperatures up to 650 F.; and that Croloys 5 and 7 maintain these improved properties even at temperatures up to 850 F.

Complete details of the tests are covered by Alloy Letter No. 265, available on request.

B&W SEAMLESS and WELDED TUBES

IT'S GOT TO BE *Continuous!*

THE STRIDE OF THE WINNER

AND

CONTINUOUS SEPARATION INCREASES PRODUCTION . . . LOWERS PROCESS COSTS

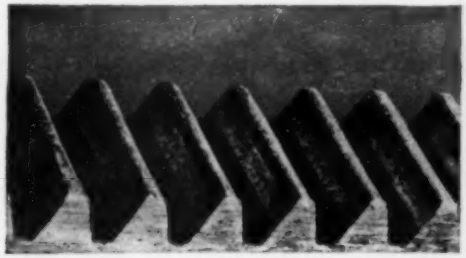
Chemical processing must flow without unnecessary interruption to be truly profitable. De Laval Separators and Clarifiers eliminate "slow spots" once made necessary by gravity settling or inferior filtering methods. By means of centrifugal force, they do in seconds work that once took minutes or hours.

For more than 70 years De Laval has been solving problems of separation and clarification. During that time many hundreds of different substances and fluids have been tested. It may well be, therefore, that some problem quite similar to yours has already been examined in the De Laval laboratory or out "in the field." If you have a problem of (1) separating two liquids continuously, or (2) clarifying one or two liquids continuously, or (3) continuously separating two liquids and continuously removing solids from one or both liquids at the same time, ***call on De Laval.*** They might already have the information you need.

THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

De Laval

the First Name in Centrifugals
the First Thought for CONTINUOUS
SEPARATION · CLARIFICATION · CONCENTRATION



This forged steel gear rack shows severe wear and pitting. The rack was made from free-machining, medium carbon, resulfurized manganese steel, corresponding in composition approximately to the A.I.S.I. C-1137 type. It was used as-forged, with a hardness of 200 Brinell, to operate against a gear made from sintered high carbon steel, copper-impregnated, with a tensile strength of 85,000 p.s.i.

This ductile iron rack, produced by The Acme Shear Company, Bridgeport 1, Conn., showed no pitting . . . after exactly the same service test as the steel rack. The only evidence of wear is a burnished appearance on edges of the teeth. This ductile iron rack had a hardness of 205 Brinell, but any hardness within the range of 150/200 proves satisfactory under similar conditions. Saving in cost is estimated at 60%, based on the low initial cost of ductile iron, and its superior machinability.

AFTER 1500 HOUR SERVICE RUN
AT 50% OVERLOAD, WEAR TEST OF RACKS
SHOWS NEW ENGINEERING MATERIAL

DUCTILE IRON *Superior to* FORGED STEEL

Low initial cost and superior machinability of Ductile Iron permit saving estimated at 60%

DUCTILE IRON is a cast ferrous product that combines the *process advantages* of cast iron along with many of the *product advantages* of cast steel . . .

In less than two years, ductile iron has attained wide acceptance because it offers excellent castability, high mechanical properties, and good machinability. Parts cast in ductile iron show superior pressure tightness, good elastic modulus and resistance to shock.

TYPICAL CURRENT APPLICATIONS: anvil blocks for forging hammers, wrenches, compressor heads, dies for forming rubber, pipe, cement mixer discharge rings, furnace doors, manifolds, press yokes, and many other parts.

AVAILABILITY: Send us details of your prospective uses, so that we may offer a list of sources from some 100 authorized foundries now producing ductile cast iron under patent licenses. Request a list of available publications on ductile iron . . . mail the coupon now.

The International Nickel Company, Inc.
Dept. CE, 67 Wall Street,
New York 5, N. Y.
Please send me a list of publications on:

DUCTILE IRON

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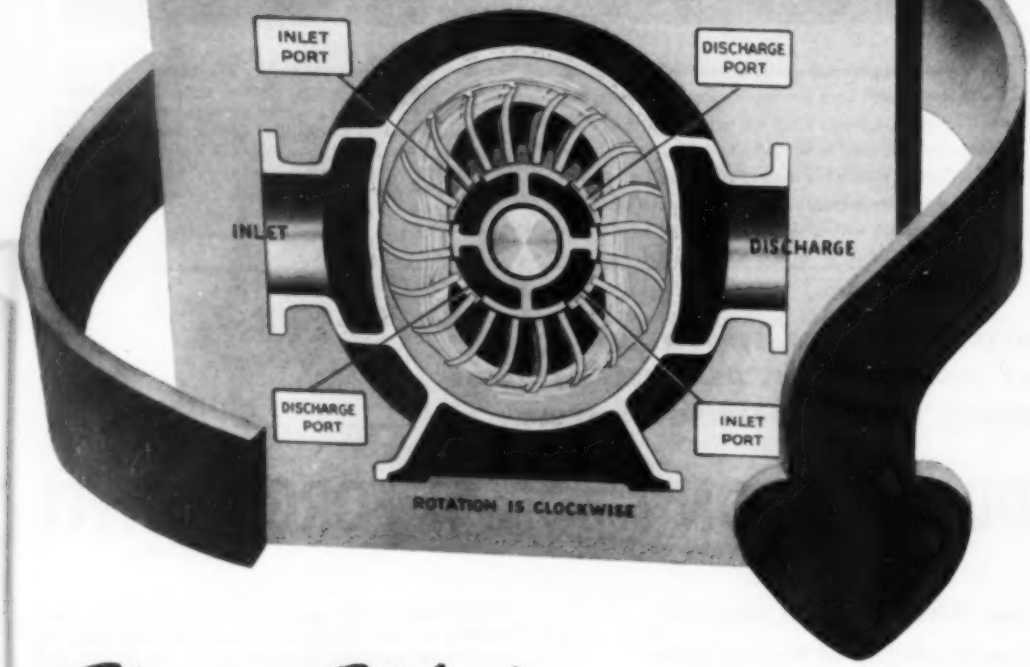
THE INTERNATIONAL NICKEL COMPANY, INC.

67 WALL STREET
NEW YORK 5, N. Y.

Nash Instrument Air Compressors deliver only clean air, free from oil or dust, and without filters



Here is Why!

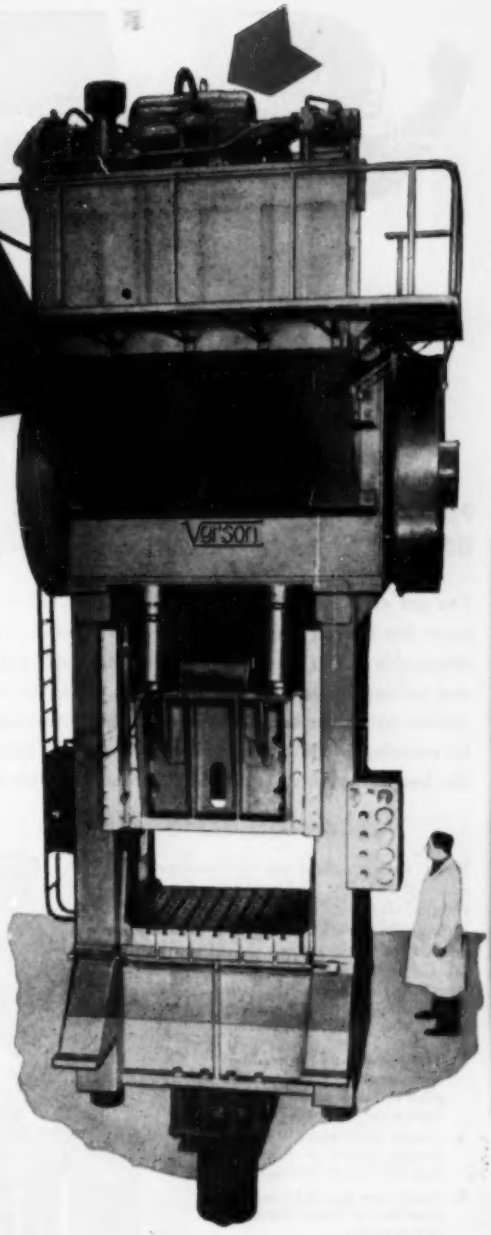
You can dispense with oil filters and dust filters when you install ®Nash® Clean Air Compressors. You can save the cost of maintaining these devices. You can greatly reduce instrument maintenance costs. For the Nash employs no internal lubrication, therefore no troublesome oil is in the delivered air. Moreover, air from a Nash is thoroughly washed and cooled as it passes thru the pump. Dust in the plant atmosphere, even fly ash, is immediately removed.

®Nash® Clean Air Compressors are simple, with only one moving element. No valves, gears, pistons, sliding vanes, or other enemies of long life and constant performance complicate a Nash. No aftercoolers are needed. You will find it profitable to investigate these pumps, now.

No oil filters.
No dust filters.
No internal lubrication to contaminate air handled.
No internal wearing parts.
No valves, pistons, or vanes.
Non-pulsating pressure.
Original performance constant over a long pump life.
Low maintenance cost.

NASH ENGINEERING COMPANY
397 WILSON, SO. NORWALK, CONN.

Machine with a POWERHOUSE PUNCH!



In one mighty blow, this giant 850-ton, double-action, deep-drawing Verson Allsteel press forms an intricate automobile part.

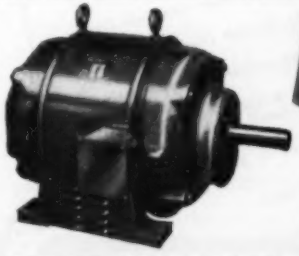
Multiply this by seven strokes a minute, 3 shifts a day, seven days a week and you have a rugged operating schedule . . . one which the Howell motors that power this fine press take right in stride.

Howell engineers worked closely with this manufacturer to select the *right* motor for each job. The main drive motor is a Howell 50 H.P. high slip, high torque motor designed specially for punch press work. The self-adjusting blankholder is driven by a hydraulic pump, powered by a 50 H.P. Howell motor. A 20 H.P. Howell motor operates another hydraulic drive.

Howell will devote the same care and attention to your electric motor problems and needs. With this cooperation and Howell quality, you're assured of motors that will stand up under the heaviest production load over long periods without interruption.

May we help you?

HOWELL ELECTRIC MOTORS COMPANY
Howell, Michigan



Howell Type F Motor. A high slip, high torque motor designed for punching and shearing operations. Sizes ½ to 200 H.P. in open frames; ½ to 125 H.P. in enclosed frames.

HOWELL Red Band MOTORS

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built industrial motors since 1915

HERCULES CARBOY BOXES

GIVE YOU EXTRA PROTECTION!

PROMPT DELIVERY

You get extra protection from these rugged, all wood carboy boxes due to their sturdy, patented construction . . . with interchangeable cork (Hercules) or rubber cushion (Aero) inserts and cushions. That's why they stand up under the rough-and-tumble of regular usage and save you both time and money by reducing bottle breakage, repairs and replacements. For the best carboy boxes possible . . . contact National!

6½-GALLON CARBOY FEATURES

Built to withstand an internal pressure of 10 lbs. this completely enclosed wooden carboy, with interchangeable cork or rubber cushion inserts and cushions, complies with I.C.C. 1-D regulations for the transportation of mineral acids. Specific application should be made for other uses.

1. Flat cover — no protruding neck—enables boxes to be piled on top of each other for convenient, compact storage.
2. Corner posts provide a convenient handle so that one man can handle the carboy.
3. Small size and light weight provides for easier handling and shipping.
4. Regulation Polystyrene cap supplied.

Complies with classification I.C.C. 1-D

13-GALLON CARBOY FEATURES

1. All-point protection reduces bottle breakage to a minimum—both in loading and transit.
2. Reduces occupational hazards since safety from breakage minimizes danger of acid burns or fire.
3. Eliminates foreign filler materials from container.
4. Easy to handle, through good grip on side hand braces.
5. Compact loading, resulting in space saving storage.
6. No skilled labor or special tools required. Any man can handle it quickly and efficiently.
7. Also available in 5 gallon and other capacities.

Complies with classification I.C.C. 1-A

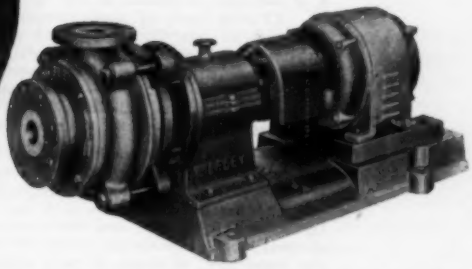
For Information write to Dept. E

NATIONAL BOX & LUMBER COMPANY

NEWARK 5, NEW JERSEY

brine solution

Buy **WILFLEY** *for Cost-Saving Performance*



This WILFLEY Acid Pump is on brine service in a modern potash mill in the Southwest. It delivers continuous 24-hour-a-day service with NO DILUTION. A companion to the famous WILFLEY Sand Pump.

WILFLEY *Acid* PUMPS

Dependable WILFLEY Acid Pumps are setting new records for cost-saving efficiency in modern chemical plants all over the world. For corrosives, hot liquids, mild abrasives, electrolytics, antibiotics, pharmaceuticals, fertilizers and steel picklers, WILFLEYS have established and are maintaining leadership in the field. Available in 10- to 2,000-G.P.M. capacities; 15- to 150-ft. heads and higher. Wetted parts of practically all machinable alloys. Plastic lined models available. Individual engineering on every application. Write or wire for full details.

A. R. WILFLEY & SONS, INC., DENVER, COLORADO, U.S.A.
NEW YORK OFFICE: 1775 BROADWAY, NEW YORK CITY

TYGON

Versus H_2SO_4

ONE good answer to many sulfuric acid corrosion problems is the versatile TYGON family of plastic compounds. Consisting of carefully compounded polyvinyl resins, TYGON—as a material of construction, as a medium of transmission, and as a protective coating—exhibits outstanding resistance to sulfuric acid over a wide range of concentrations and conditions.

TYGON is available in molded, calendered and extruded form, as a plastisol and as a solvent type paint. Each form is specifically suited for certain applications. Each has its limitations. All have the basic characteristics of vinyl based materials. All are backed by the "know-how" of almost 87 years experience in corrosion control.

As a material of construction, TYGON is used primarily in sheet or molded form, although extruded tape, channel, or solid cord is sometimes used. In 3/32" thick sheets TYGON is used to line tanks, drums, and hoppers; to protect fume hoods and ducts; to cover work tables and floor areas. TYGON sheets are also cut into gaskets for positive, enduring seals in all types of process equipment. TYGON sheet resists sulfuric acid, its fumes and salts, for long periods in concentrations up to 42°-55°Bé acid, or equivalent, depending upon the compound used. Service temperature limit ranges from 150° to 175°F. Molded TYGON sees service as grommets, washers, gaskets, stoppers, handles, bumpers and special fittings. In these forms, TYGON resists up to 55°Bé acid at temperatures ranging up to 200°F. With either sheet or molded TYGON, prolonged contact with fuming sulfuric acid, sulfuric anhydride, and mixed acids is not recommended without the counsel of U. S. Stoneware engineers.

As a piping medium, TYGON is most generally used in the form of extruded tubing. However, some short flexible couplings and other special fittings may be molded, or cast from plastisols. Lightweight, flexible TYGON Tubing, in sizes up to 2" ID, is used as temporary or permanent transfer lines, as flexible connections, as inlet and discharge ports on acid pumps, as gas lines, or as syphon hoses. TYGON Tubing resists up to 55°Bé sulfuric acid at temperatures as high as 200°F. Specific temperature limits vary according to the compound used, the pressures involved and the wall thickness of the tubing. Where constant pressures of more than 40 psi are involved, braided jacket reinforcement is available and should be used. Prolonged use with fuming sulfuric acid, sulfuric anhydride, and mixed acids is not recommended without consultation.

As a paint, TYGON affords excellent protection to tanks, equipment, structural steel, walls and ceilings, against the fumes or spillage of sulfuric acid in any concentration. Temperature limit is approximately 200°F. The limitations of a thin film should be realized and contact, other than brief or intermittent, with concentrated acid, moist sulfur trioxide, and mixed acids should be avoided. For mild environments a primer and no less than two top coats should be used. For severe exposures a minimum of five coats plus primer is advised.

For a heavier duty coating, TYGON as a plastisol (TYGOFLEX) can be applied by dipping and fusing, or by spraying. TYGOFLEX is particularly suited to the application of a thick coating on intricate shapes, with or without adhesion.

In any of its forms, TYGON provides low cost protection and high degree of safety in the handling of not only sulfuric acid and related chemicals, but a wide range of other acids, alkalies, oil, greases and water. The number of forms available and the flexibility possible in mechanical, physical and chemical properties of the standard compounds permit its proper use in many applications. The versatility of TYGON is further increased by the availability of custom compounding and molding. For the best results with TYGON, consultation with U. S. Stoneware engineers is strongly urged.

TYGON plastics

In addition to TYGON in its various forms, we also manufacture a number of other materials capable of handling sulfuric acid in any concentration and under all types of operating conditions. These products include chemical stoneware and porcelain, acid proof brick and cements, homogenous lead linings, and other organic linings and coatings.

Why don't you submit your corrosion problem, today? There's no obligation and we'll be pleased to be of assistance. So write, now!

1836

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ENGINEERS, MANUFACTURERS, ERECTORS OF CORROSION-RESISTANT EQUIPMENT SINCE 1865

THE Chementator

Reg. U.S. Pat. Off.

Prepared under the editorial direction of Joseph A. O'Connor, News Editor

Alcoa turns to lignite

First aluminum reduction plant ever to use lignite as fuel will be the $80 million plant of Alcoa to be built in Milam County, Tex., about 60 miles south of Waco. When it starts operating in the fall of 1952, it will produce 85,000 tons of aluminum annually. The plant will consist of units for lignite processing, power generation and aluminum reduction. Texas Power & Light Co. will operate the power-generating unit.

About 7,000 tons of lignite will be processed daily into 3,200 tons of char and 2,300 bbl. of tar. Process consists of (1) drying crushed lignite in a fluid bed, and (2) carbonizing the dried lignite at low temperature to produce tar and the char that's used as fuel (for details, see p. 219). The process was pioneered by Texas Power & Light and the U.S. Bureau of Mines. It promises a revolution in fuels and coal chemicals.

This move frees Alcoa from dependence on federal power development; it protects Alcoa from long-range increases in fuel costs; and it may put the company into the business of producing aromatic chemicals.

Using dried lignite char, Alcoa reportedly will be able to get its power for 3.5 mills per kwh. Credit for tar and oil byproducts might trim this to 2.5 mills. Byproduct tar recovery would put Milam County lignite char on a par with natural gas selling at 5 to 8 c. per 1,000 cu. ft. And Milam County has plenty of lignite, easily mined by power shovel from near-surface seams, at a cost of $1 to $1.50 per ton. If Alcoa's venture pans out, use of lignite as fuel may catch on in other parts of the United States, particularly in states like Montana and North Dakota.

New way to separate aromatics

Another new process for separating aromatics made from petroleum has been developed by Dow Chemical Co. and Universal Oil Products Co. It's a solvent extraction process, using diethylene glycol.

This Udex process recovers xylenes, benzene and toluene from aromatics made by catalytic reforming of naphthas. A Udex unit can be teamed with one of Universal's Platformers for the production of aromatics from petroleum.

First commercial Udex unit will be installed at the Mount Pleasant, Mich., refinery of Roosevelt Oil & Refining Co. Feedstock will consist of liquids formed by mild hydrogenation of a hydrocarbon cut from plants producing ethylene by thermal cracking.

Easing the shortage of engineers

BLUEPRINT—Labor Secretary Maurice J. Tobin has unfolded the government's blueprint for easing the shortage of engineers by making better use of them and training new ones.

It was drawn by the Labor Department with help from the government's defense agencies and private organizations. Among participants: the Engineering Manpower Commission of the Engineers' Joint Council, the AFL's American Federation of Technical Engineers, the Council of State Governments, the National Association of County Officials and the American Municipal Association.

In disclosing the plan, Tobin points out that a solution of the shortage of engineers is necessary to the success of the defense production program, and that government and industry must work together to supply the needs of both.

This National Program to Meet Shortage of Engineering Personnel is divided into two parts: (1) what industry can do to help; and (2) what the government and others have done.

INDUSTRY'S ROLE—Under the voluntary manpower program contemplated, Tobin feels that industry should assume responsibility for (1) making the most possible use of engineers at their highest skills, (2) insuring adequate economic rewards so that engineers won't turn to other work, and (3) making it easier for engineers in less essential activities to shift to work more directly related to defense production.

These are the suggestions to employers:

(1) Make maximum use of engineers already employed. Also, figure out how many can be shifted to defense production and how many can be loaned to other plants.

(2) Make better use of supporting engineering personnel by assigning to engineering assistants, aides and draftsmen more of the routine and detailed work done by professional engineers.

(3) Determine the need for training required to prepare lesser skilled technicians for some of the tasks performed by engineers; organize and arrange for training.

(Continued on page 108)

(4) Stabilize the present engineering staff by identifying and correcting conditions that contribute to turnover and absenteeism.

(5) List engineering openings with state employment service offices.

WHAT'S BEEN DONE—These are the steps that have already been taken:

(1) Federal agencies have been instructed to make maximum use of engineering personnel.

(2) Various organizations are cooperating with state employment services in exploring the possibilities of utilizing engineers on a full or part-time loan basis.

(3) The U.S. Office of Education has made plans to reactivate the Engineering, Science, Management War Training (ESMWT) program of World War II for intensive short-term college courses. This National Defense Training Program is designed to prepare persons for specific jobs in defense plants. Engineering schools and colleges have been asked to make available their services and facilities to key defense industries, including part-time employment of faculty and students.

(4) Local draft boards have been urged to give serious consideration to the deferment of draftsmen and engineers.

(5) Ways to conserve engineering manpower in both the military and civilian branches of the Defense Department have been discussed.

(6) The country's 1,800 local employment offices are working with high school and college officials to induce more high school graduates to enter engineering schools.

(7) EJC's Engineering Manpower Commission has embarked on a big program to encourage more high school students to enter engineering colleges and schools, and to promote better use of engineers in industry and government. It has assembled facts to help bring about more realistic policies on the drafting and recall to service of engineers. Employers of engineers are being kept informed of critical shortages and are being told how to conserve and make better use of engineers.

Freeport strikes it rich

Biggest single sulphur deposit found anywhere in the world in 20 years has been discovered at Garden Island Bay in the marshes of the lower Mississippi delta, 100 miles southeast of New Orleans. It will be a major factor in licking the world sulphur shortage.

To exploit this discovery, Freeport Sulphur Co. will build, at a cost of $10 million to $15 million, a sulphur mine that will produce 500,000 long tons a year. It's expected to be ready for operation by 1953.

In its exploration for oil, the Texas Co. discovered the new deposit of native sulphur or brimstone in a typical salt dome formation. Texas Co. leased the sulphur rights to Freeport, and will share in the profits on a 50 percent basis.

Currently, the world is short about 1 million long tons of sulphur and sulphur equivalent. Development has already started on three new mines in the U.S. with an expected combined production of 530,000 long tons. In addition, other projects have been undertaken to get sulphur from natural and refinery gases and from other sources. Now, the expected 500,000 tons a year from the new Freeport mine promises to boost sulpur output high enough to close the gap. If all projects are carried out and if production from existing sources holds up, the shortage should be over before the end of 1953, according to Director James Boyd of the U.S. Bureau of Mines.

Titanium: into the big time

Not one, but two large plants almost certainly will be built to produce titanium metal in big tonnages (see *Chementator*, June 1951, p. 71). Negotiations between Du Pont and the government for a 10-ton-a-day plant near Wilmington, Del., are entering their final stages.

Du Pont will get a certificate of necessity from the government and a procurement contract that guarantees purchase of the titanium. The titanium will be used in defense production.

This plant will be just about as big as the one that Titanium Metals Corp. of America, jointly owned by National Lead and Allegheny Ludlum, will install at Henderson, Nev. By late 1952 the Henderson plant will be turning out titanium at the rate of 3,600 tons a year. The plant will consume 151 million kilowatt-hours per year from Hoover and Davis Dams. Titanium Metals has been granted a $14 million certificate of necessity.

Both plants will get titanium metal by reducing the tetrachloride with molten magnesium. Meantime, there's much speculation about whether the new process of Horizons Titanium Corp. (see *Chementator*, Aug. 1951, p. 69) is actually the long sought electrolytic one. The Navy says it will cut the cost of making sponge titanium from $5 per lb. to $1 or less.

Right now, the rate of titanium production is between 500 and 1,000 tons a year. By the end of 1952 it's expected to top 5,000 tons a year. Tonnage titanium is fast becoming a reality.

Versatile ion exchange processes

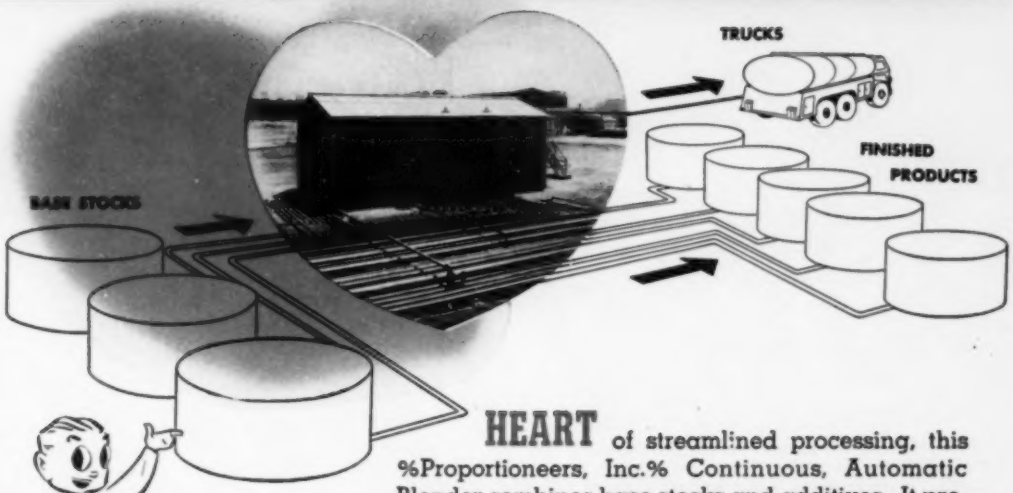
Putting ion exchange processes to work often eliminates waste disposal problems, reduces operating costs and turns waste into profit.

Spencer Chemical Co., for example, at its Calumet City, Ill., plant is removing formic acid from formaldehyde by ion exchange.

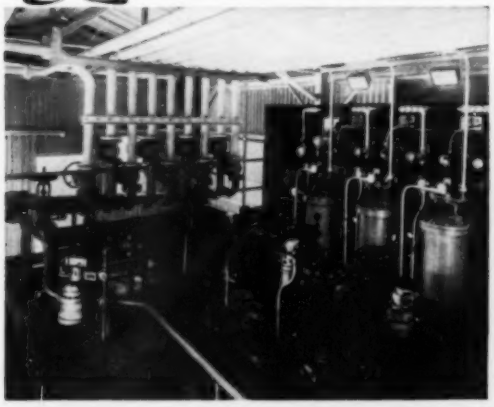
A major producer of blood plasma is using ion exchange at its Gulf Coast plant, removing calcium

(*Continued on page 112*)

BLEND COMPONENTS *Continuously Automatically*



HEART of streamlined processing, this %Proportioneers, Inc.% Continuous, Automatic Blender combines base stocks and additives. It provides new speed, flexibility and economy in the production of uniform blends. The system reduces manpower, eliminates blending tanks, agitation, auxiliary pumps and attendant piping. Because the finished product is immediately available, tank trucks can be loaded without waiting. The %Proportioneers, Inc.% Continuous, Automatic Blender, preset to formula, controls component ratios and permits quick adjustment of output to suit demand rates. This installation at refinery of Richfield Oil Corporation at Watson, Calif., delivers a variety of finished products, exactly to formula, to trucks and/or storage tanks.



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FIVE PLUS BANDS OF PROTECTION

make this the longest-lived chemical motor

You get more protection against corrosive materials with the Westinghouse Life-Line chemical motor than with any other. Take this example:

An Eastern Fuel and Gas Company has a cyanide pump that pumps thyocyanate. At times the pump leaks, throwing thyocyanate over the motor. Conventional motors rotted out at the feet in about six months. A Life-Line installed on this same pump for over a year brought this statement from the foreman of electrical maintenance:

"This is the first motor we did not have to drill out the bolts and screws to take the motor apart. A closer inspection of the motor showed the end brackets and frame in excellent shape; the fan, windings and rotor looked as good as the day they left the motor plant."

Consider the five plus bands of protection. You'll understand this extra life. The frame, feet, and brackets are steel. (*Note: Steel and cast iron of same thickness have approximately equal corrosion resistance. See graph below.*)

This steel is first Bonderized then a formaldehyde alkyd-type enamel, well known for its superior corrosion resistance, is baked on. Two dips and bakes of tough, flexible Thermoset varnish follow. Finally, the motor is sprayed with a finish coat of gray lacquer. Five bands for longest life!

DO YOU NEED SOMETHING EXTRA IN A MOTOR?

Extra protection against corrosion—or outage from any cause? Check Life-Line—they cost no more. Ask your Westinghouse representative for a copy of Chemical Motor Booklet B-4687, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

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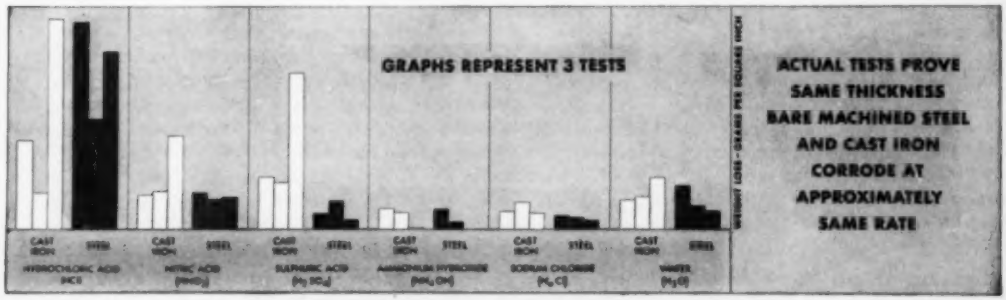

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MOTORS and CONTROLS

and magnesium ions and substituting sodium. This prevents clotting of plasma.

In metal plating, chromic acid can be purified and recovered by ion exchange. One exchange process saves up to 90 percent of the chromic acid used in metal treating by removing impurities from the bath solution. Another ion exchange resin prevents waste by recovering the chromates in the rinse water for conversion to free chromic acid.

In phosphoric acid pickling, a new process reclaims the acid for further use, making phosphoric acid pickling no more expensive than sulphuric acid pickling. Corrosion is eliminated, a desirable phosphate coating is produced and iron loss is reduced.

Still another exchange process economically recovers such metals as copper, zinc and nickel, making it easier to dispose of the remaining solutions, which once posed serious waste disposal problems.

Mathieson is treating ethylene glycol by ion exchange.

At its new Elkhart, Ind., fermentation plant, Miles Laboratories, Inc., will use ion exchange to remove heavy acids during the manufacture of citric acid.

New uses for ion exchange processes are being developed all the time. Many companies are active in this field, among them Illinois Water Treatment and Permutit.

Cobalt: from Blackbird to jets

NEW PROCESS—Cobalt can be won from U.S. ores by a new process developed by Chemical Construction Corp. Fastest growing use for this vital strategic metal is in high-temperature alloys for jet engines. Right now, the U.S. consumes cobalt at the record rate of more than 8 million pounds a year. Nearly all of it is imported. But soon as much as 4 million pounds a year will be coming from two U.S. sources, thanks to the new Chemico process.

U.S. SOURCES—Far and away the best bet for large amounts of cobalt is the Blackbird mine of Calera Mining Co. near Forney, Idaho. Originally staked as a gold mine in 1893, the Blackbird mine is today believed to be one of the largest cobalt deposits in the U.S. The other source is the Fredericktown, Mo., holding of St. Louis Smelting & Refining Co., a subsidiary of National Lead.

BLACKBIRD ORE—Mineralized rock from the underground workings at the Blackbird mine contains chalcopyrite, cobaltite, pyrite, pyrrhotite and gold. Cobalt and copper occur as the sulphides. Cobalt in the ore runs about 0.6 to 0.8 percent, the copper twice that much.

DIFFICULTIES—Separating the cobalt mineral from the rock and from the copper mineral and then carrying out the final reduction to metallic cobalt are no easy jobs. The U.S. Bureau of Mines has, since 1942, been trying to develop a technique for processing the Blackbird ore. The Bureau finds the high-sulphide ore can be treated by selective flotation, supplemented by low-temperature calcination of the cobalt-iron concentrate and the reflotation of the cobaltite. Howe Sound Co., parent of Calera Mining, became interested in 1943; its research was so successful that it decided to go ahead with large-scale operations.

CONCENTRATING—In Calera Mining's new concentrating mill at the Blackbird mine, ore is conditioned for a long time at elevated temperature before flotation. This conditioning makes possible a remarkably sharp differential flotation of the chalcopyrite, cobaltite and pyrite. Separate concentrates of copper, iron and cobalt are made in succession. The iron goes to tailing. The other two concentrates—one containing about 20 percent cobalt and the other about 25 percent copper—will be shipped to Garfield, Utah, where the copper concentrate will be processed in the Garfield smelter of American Smelting & Refining Co. Cobalt concentrate will go to the new refinery being erected by Howe Sound at Garfield.

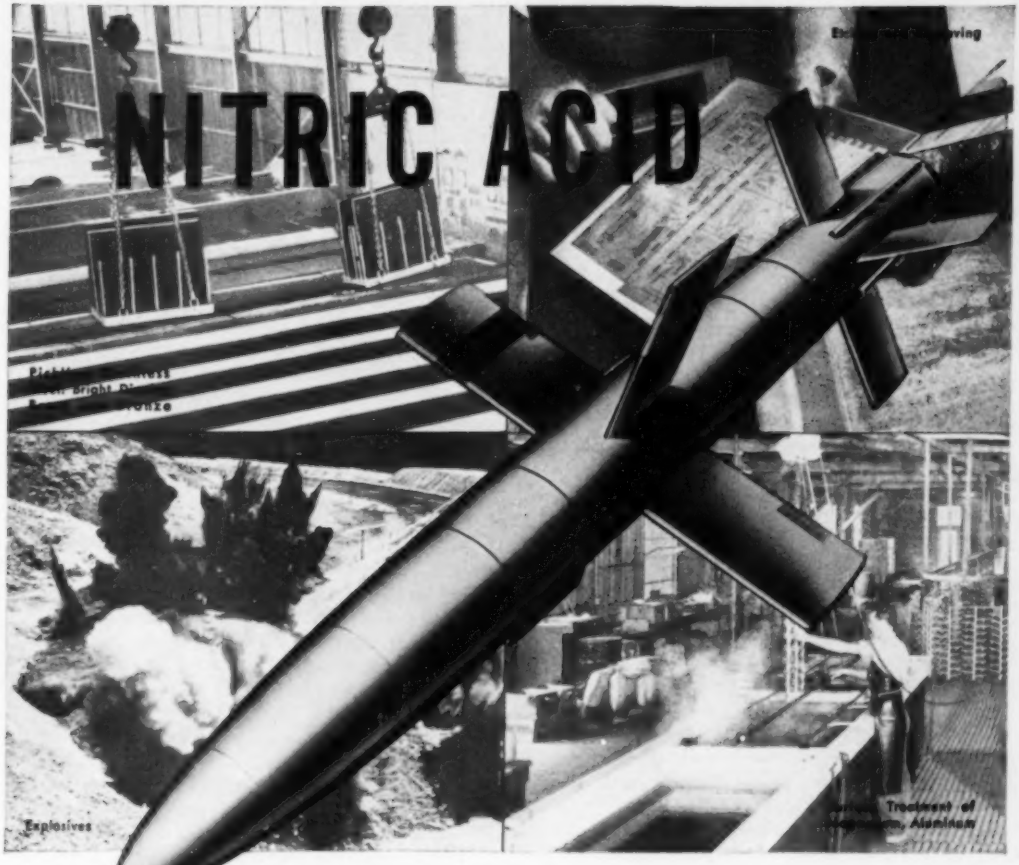
REFINING—There the new Chemico process for treating the cobaltite concentrate will be used to recover the cobalt. Howe Sound will be lucky if its Garfield refinery is producing cobalt by late 1952. The difficulty, despite high priorities, is in getting the cobalt processing equipment. The lag seems to be in what is said to be "high-pressure equipment," as well as evaporators, condensers and filters. Special stainless steel filters of "very large size" are being built for the refinery. According to those on the scene at Garfield, "The equipment called for makes it look as if an absolutely new process is involved."

OUTPUT—Urged by the government, Howe Sound will expand its original production plans. The concentrator, which has just started operating at the Blackbird mine, can handle 600 tons a day. Milling capacity will be boosted to 1,000 tons a day. This will enable the Garfield refinery, when it gets going, to turn out, not the 2 million pounds a year originally planned, but 3.3 million pounds of cobalt metal, virtually all going to the government.

FREDERICKTOWN—Cobalt and nickel occur at the Fredericktown, Mo., deposit with sulphides of lead, iron and copper. Concentrates of cobalt-nickel sulphides have recently been stockpiled as the Fredericktown ore body has been worked for copper and lead. The flotation concentrates will be treated by the new Chemico process to produce cobalt metal. Fredericktown can be counted on for as much as 800,000 lb. of cobalt annually once it gets rolling, perhaps late this year.

U.S. PRODUCTION—Only present producer of commercial cobalt in the U.S. is Bethlehem Steel Co., which recovers cobalt concentrate as a byproduct of

(*Continued on page 114*)



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For your Nitric needs, consult General Chemical first. Further information on any of the grades and strengths listed here may be obtained from the nearest General Chemical office.

Grades of General Chemical Nitric Acid include:

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Reagent, A.C.S.
Sp. Gr. 1.42

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its magnetic iron ore operation at Cornwall, Pa. The cobalt occurs as a sulphide. The iron ore, containing a little less than 1 lb. of cobalt per ton, is magnetically separated from the cobalt-bearing minerals, and a concentrate averaging about 1.3 percent cobalt is produced and sent to the Pyrites Co. of Wilmington, Del., for processing to metal and other cobalt products. The 1950 production was 793,813 lb. of contained cobalt, less than one-tenth of U.S. consumption. Total U.S. production of cobalt metal was 1,817,600 lb. (cobalt content) in 1950, a gain of 2.5 percent over 1949.

CONSUMPTION—Cobalt consumption in the U.S. soared to a record 8,280,769 lb. in 1950, up 76 percent from 1949 and 65 percent greater than in the former record year 1948, when it first topped 5 million pounds. High-temperature alloys and magnetic alloys together took 62 percent of all cobalt consumed, twice as much as they took in 1949.

USES—High-temperature alloys are the fastest growing use for cobalt. Other important uses: magnetic alloys, cemented carbides and high-speed cutting tools. Cobalt salts are used as driers in paints and varnishes. The oxide is used in ceramic glazes and in frit for porcelain enamel. An all-out defense effort with mounting requirements for jet engines, high-velocity projectiles, armor plate and electronic equipment would call for astronomical quantities of cobalt. Hence the drastic NPA cutback in non-essential uses.

PRICE—Unlike prices of most metals, that of cobalt hasn't fluctuated wildly. Since 1939, when the price was $1.24 per lb., it has risen at intervals to its present price of $2.10.

IMPORTS—Up to now, the U.S., even though it's the world's biggest consumer, has produced only a small amount of cobalt. Nearly all cobalt used in the U.S. is imported. Last year, the U.S. imported a record 9,097,295 lb. of contained cobalt, up 22 percent from 1949 and 3 percent greater than in 1948, the previous record year. World's biggest source is the Belgian Congo, with Northern Rhodesia a poor second. French Morocco and Canada also produce cobalt. Now, however, the U.S. can look forward to getting half or more of its current requirements from its own ores, using the new Chemico process.

Acetylene from natural gas

GERMAN PROCESS—Chemical Construction Corp. is ready to design and build plants for the production of acetylene from natural gas. Chemico has acquired from Badische Anilin & Soda-Fabrik the exclusive North American rights to the German process, which has been proved in commercial use. To U.S. chemical industry the process offers this major economic advantage: it produces acetylene of high purity at low cost.

PARTIAL OXIDATION—The process is the same one that Monsanto will use and is similar to that of Carbide & Carbon. Both are largely based on the German Sachse process. Basic steps in the process that Chemico has acquired are simple. First, natural gas hydrocarbons are partially oxidized to furnish a crude acetylene gas. This is then purified to yield acetylene of any required purity.

PURIFICATION—Heart of the process is the use of a selective solvent specially developed for this purification. Getting pure acetylene from the dilute effluent gas from the pyrolysis is a tough job. Major capital and operating costs are involved in this separation step.

First, a large volume of methane and hydrogen must be removed. Then the product must be freed of olefins and higher acetylenes. The earlier German technique of using water scrubbing under pressure is believed to be less economical, because of multi-stage operation and the large towers required, than the use of a selective solvent.

SOLVENT—The ideal selective solvent would have these properties: low cost, high acetylene solubility, high selectivity for acetylene, high boiling point, low molecular weight and high thermal stability. Some of the solvents proposed include Cellosolve, acetone, triethyl phosphate, dioxane, furfural, tetrahydrofurane, butyrolactone, dimethoxytetraethylene glycol and dimethyl formamide, which is most attractive because of its high solubility and selectivity for acetylene. Chemico, however, uses none of these, coyly refuses to tell what its new low-cost solvent is. Still far off, but not to be discounted, is the possibility of an even cheaper solvent.

ACETYLENE USES—Acetylene is essential for the manufacture of such diverse products as synthetic rubber, vinyl plastics, synthetic fibers, sulfa and other drugs, and artificial blood plasma. Today, chemical companies are hard at work on new ideas for revolutionary products made from acetylene. By offering a proved economical process for its production, Chemico is playing a vital role in meeting the swift-rising demand for acetylene.

First glycol plant on West Coast

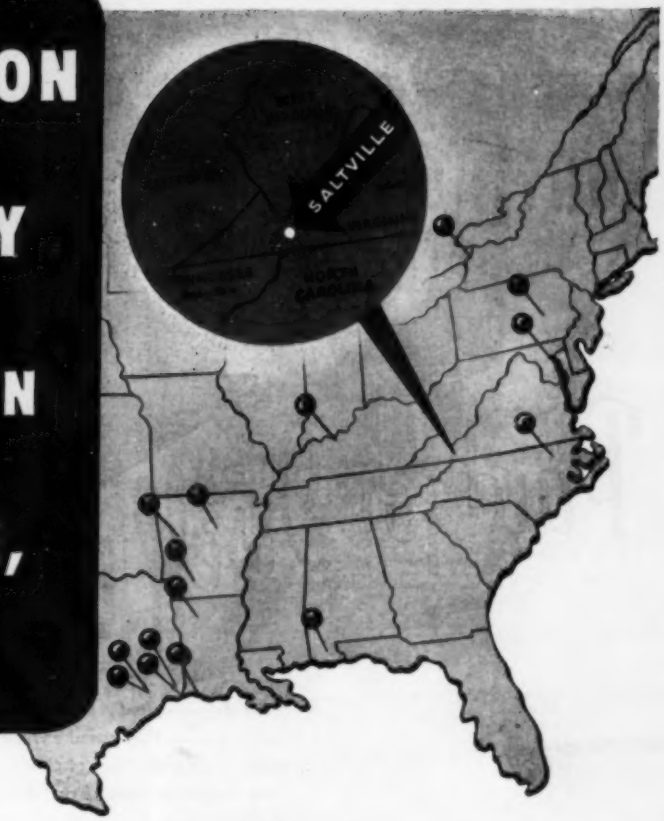
A decision has finally been reached by Hancock Oil Co. to go ahead with the first glycol plant on the West Coast. Construction will start this year on the $4 million plant at Long Beach, Calif. It will produce ethylene glycol and ethanolamines.

Much glycol will go into anti-freeze. And the current sulphur shortage has increased ethanolamine demand; it's used to absorb hydrogen sulphide from sour natural gas as the first step in getting sulphur from the gas.

Hancock won't say much about the process it will use at Long Beach, other than that it had to go abroad to get it.

—*End*

PRODUCTION has PRIORITY with MATHIESON at SALTVILLE, Va.



Plant expansion... modernized facilities, new products, increased capacity... characterize modern Mathieson policy. At Saltville, Virginia, for example, the construction of new mercury cell electrolytic facilities will further increase the rayon grade caustic soda capacity of the first alkali works established in the South 59 years ago. This new capacity will serve the growing rayon and textile industry of the Southeast.

Adjacent to vast sources of salt and limestone—chief raw materials of alkali manufacturing—Mathieson's Saltville Plant now produces these important chemicals:

Caustic Soda • Soda Ash • Bicarbonate of Soda
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Production has priority in all of Mathieson's 16 strategically situated plants... to provide dependable sources of basic chemicals for vital American industries. You may find it to your advantage to discuss with Mathieson now your future chemical requirements. Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Maryland.

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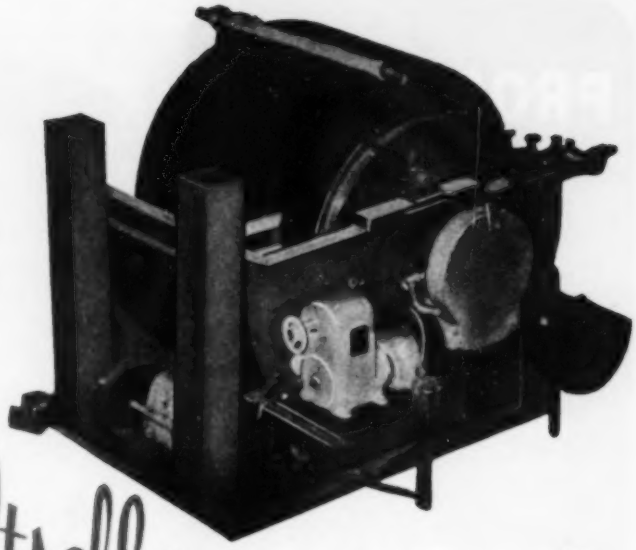


Paid for Itself in 3 Months

By delivering a filtrate clear enough to recycle, a FEinc String Discharge rotary vacuum filter saved enough in three months on water alone to pay for itself. This manufacturer of plastic products originally used six concrete settling tanks to recover cellulose acetate grinding waste. The dirty effluent was dumped down the sewer. Now a FEinc high-submergence filter recovers all the valuable plastic, and saves the filtrate too! The String Discharge picks the cake cleanly from the cloth in one continuous sheet, supported by strings. No smearing or blinding of the cake, no scraper wear or compressed air blow-back.

FEinc's Compression Dewatering pays off handsomely, too, by squeezing 2-6% more of the moisture out of the cake. Like the case where a FEinc unit replaced a scraper filter on hydrated alumina, removed 400 lbs. more water per hour, eliminated sticky fines, and permitted use of a more efficient conveyor type dryer.

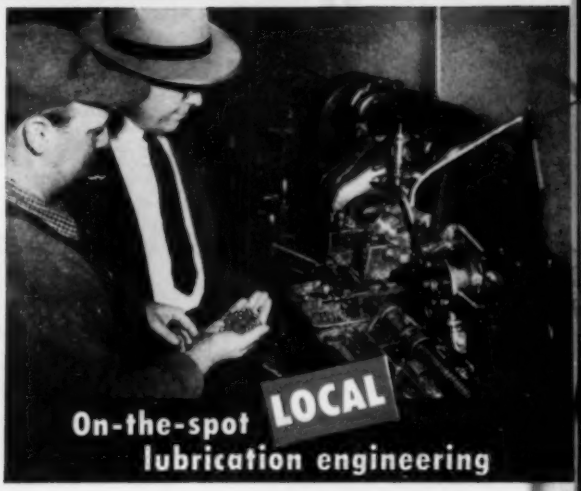
If it's clean cake or high soluble recovery you want, look to the FEinc submergence washing mechanism. For instance, a FEinc washing filter now delivers a perfect pH 7 in a cake that couldn't be washed better than pH 5 on a competitive filter.

Any combination of FEinc features can be built to make your toughest filtering, washing, drying and cake-handling seem easy. Pilot Plant filters available on rental-purchase plan for try-outs or small production work.

HAVE YOU YOUR COPY?
Complete details in Bulletin 103. Send for it today—it's free.

FILTRATION ENGINEERS INC.
155 ORATON STREET · NEWARK 4, N.J.

Now more important than ever to you...



Standard's LOCAL Lubrication service

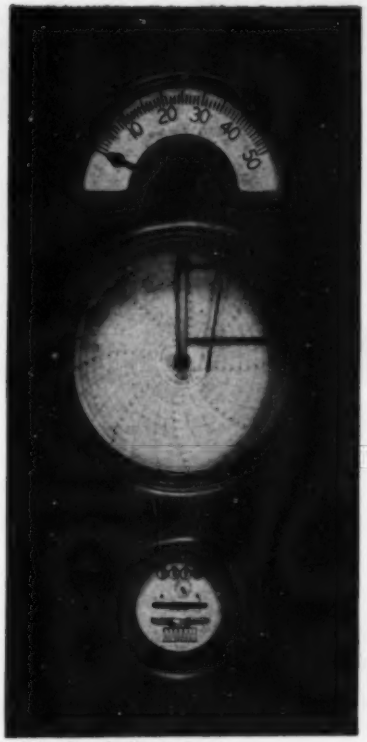
• Wherever you are located in the Midwest, there's a Standard service-supply center close at hand. That means prompt delivery of Standard products, immediate assistance from a Standard lubrication specialist.

There's no need to worry over possible production delays due to lack of the right cutting oil, lubricant, or fuel . . . no need to stock-pile these supplies in your own plant . . . no need to wait for help in solving your lubrication problems.

To take advantage of Standard's time-saving *local* lubrication service (now more important than ever to you) call the Standard office in your area. Or write: Standard Oil Company (Ind.), 910 South Michigan Avenue, Chicago 80, Ill.

STANDARD OIL COMPANY STANDARD (INDIANA)

Integrator



Indicator-Recorder-Integrator

Varying flows are accurately totalized because the integrator is continuous

The Republic flow integrator, being of the modified watt-hour type, totalizes continuously—not intermittently. It operates independently of the recorder and its accuracy is not dependent on or affected by any clock mechanism or mechanical action.

The Republic meter is, on this account, peculiarly fitted to follow all changes in flow rate and accurately measure highly fluctuating flows.

ALL TYPES OF FLUIDS

Republic electric type flow meters are available for measuring the flow of all types of liquids and gases. Meter bodies are built for metering fluids at line pressures up to 5,000 lb. per sq. in. and for all ranges of differential pressure. The reading instruments—indicator, recorder and integrator—are of the remote reading type and can be located any distance from the point of flow measurement.

ANY COMBINATION

While each Republic reading instrument is standard in design and construction each is especially calibrated for the particular flow measurement for which it is specified. Any reading instrument, indicator, recorder or integrator, may be obtained separately or in any combination desired, making possible the highest degree of flexibility in plant use.

SIMPLE IN OPERATION

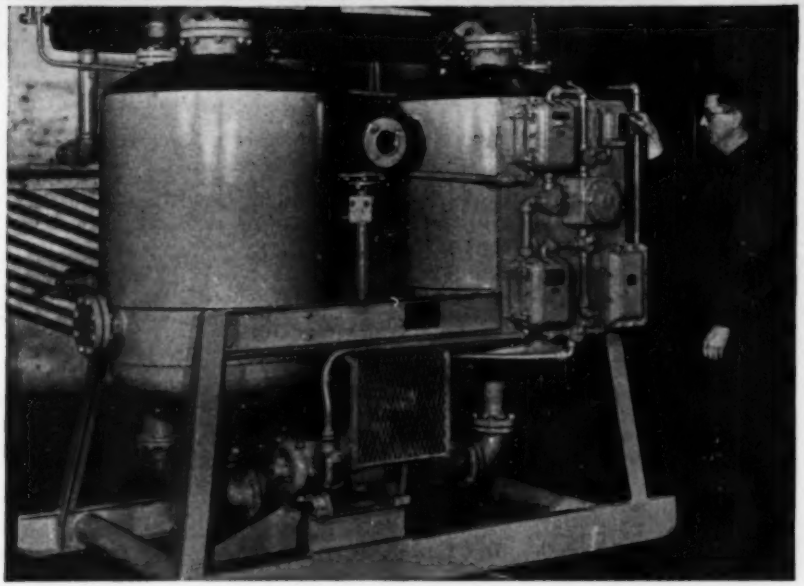
The Republic electric meter is the only flow meter commercially manufactured which is strictly electric in its operation. All other types of so called electric meters use the motion of the mercury to move a float or produce a force which is then converted into an electrical value which is in turn transmitted to a receiving or reading instrument. In the Republic meter, the transmitted electrical value is determined directly by the mercury motion, thus eliminating one of the steps in the sequence, and simplifying the mechanism to that extent. There are no floats, levers, cams, rotating shafts or anything else to interfere with the unimpeded movement of the mercury, which has no work to perform, but merely fulfills the function of making contact.

NEW DATA BOOK

Just off the press—a completely new data book describing and illustrating, in detail, the operating features of the Republic Flow Meter and its many applications. Write for your copy of Data Book No. 702—there is no obligation.

REPUBLIC FLOW METERS CO. ● 2240 DIVERSEY PARKWAY • CHICAGO 47, ILLINOIS

for minimum DRYer investment
choose the new Lectrodryer model "BY"



Built to A. S. M. E. code. Operates on pressures up to 150 p.s.i.g. Higher pressure models optional. Wide range of capacities—to 30,000 standard c. f. m.

We stepped up the tempo for this new model "BY" Lectrodryer* to enable you to DRY air with a minimum investment in equipment.

By speeding up the DRYing cycle (reversing the DRYing-regenerating cycle oftener) the new Lectrodryer can operate with less activated alumina. This means that the "BY" Lectrodryer itself can be smaller, and hence cost less. Besides, it has only one moving part—the valve reversing mechanism. Its operation is completely automatic.

This Lectrodryer is new—but old enough to have been thoroughly tested in customers' plants.

We'll be glad to tell you more about how the new Lectrodryer model "BY" can help control your WETth problems at substantial savings in original equipment investment. Just write Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Pennsylvania.

QUICK SPECS
ON THE NEW "BY" LECTRODRYER

Fully automatic
Lower first cost
Low operating cost
Simple—
only one moving assembly
Steam or electrically reactivated
Compact

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In Australia: Birlec, Limited, 51 Parramatta Road, Glebe, Sydney.
In France: Stein et Roubaix, 24 Rue Erlanger, Paris XVI.
In Belgium: S. A. Belge Stein et Roubaix, 320 Rue du Moulin, Bressoux-Liege.

LECTRODRYERS DRY
WITH ACTIVATED ALUMINAS

LECTRODRYER
* REGISTERED TRADEMARK U.S. PAT. OFF.

PORTER *Lubricated* PLUG VALVES

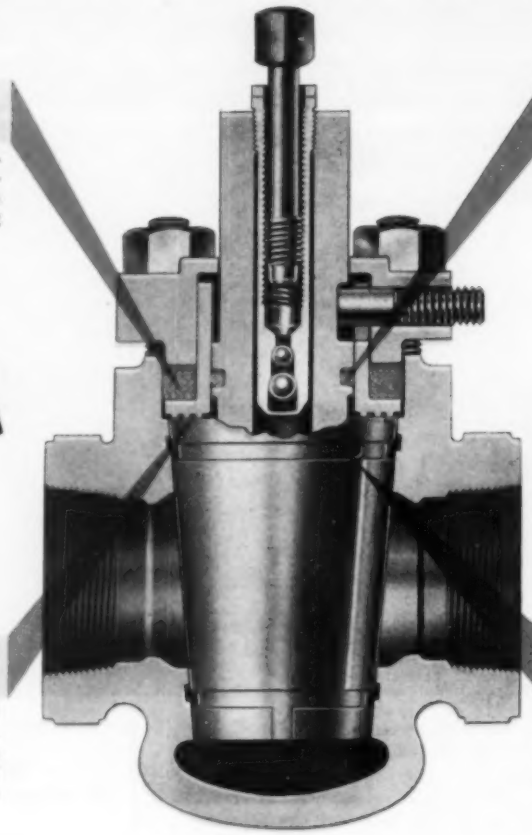
Generous size RESILIENT PACKING

permits initial compression. Completely enclosed in non-rotating metal—it's free from all moving parts insuring longer life.

O-RING,

under initial compression, seals against inner and outer surfaces preventing leakage past shank of valve.

SAFE



SURE

"LABYRINTH" SEAL

between bottom of gland bushing and top of plug face. This grooved design provides a much more effective seal than that obtained by a single surface.

Two vertical LUBE GROOVES 180° apart,

and two connecting horizontal grooves. With the Porter design, the products being handled never come in contact with lubrication grooves.

PORTER "Better Built" EQUIPMENT

ONLY PORTER LUBRICATED PLUG VALVES HAVE ALL THESE FEATURES . . . Remember this when you buy.

For complete control of fluids and gases, the Porter Lubricated Plug Valve offers important design improvements — resulting in more effective control and longer life of the valve.

Exacting engineers have found the Porter Lubricated Plug Valve to be the best buy when control is needed most.

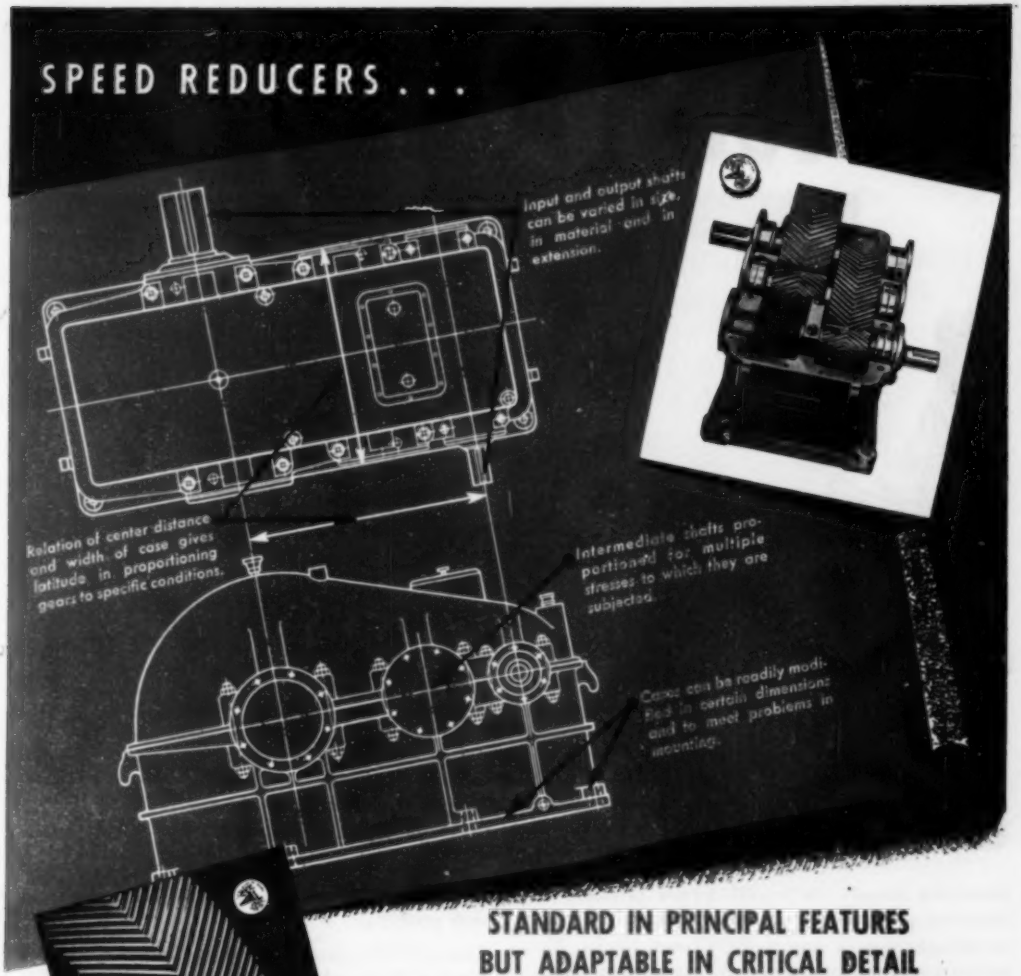
Illustrated Catalog, showing dimensions, list prices and accessories. Please request it on your company letterhead. Of course it's FREE.

JARECKI VALVE DIVISION

H. K. PORTER COMPANY, INC.

DRAWER 2650 TULSA 1, OKLAHOMA

SPEED REDUCERS . . .


Input and output shafts can be varied in size, in material and in extension.
Relation of center distance and width of case gives latitude in proportioning gears to specific conditions.
Intermediate shafts proportioned for multiple stresses to which they are subjected.
Cases can be readily modified in certain dimensions and to meet problems in mounting.

PRECISION GEARS

The quiet, vibration-free performance you can expect from the herringbone gears used in Farrel speed reducers results from extreme accuracy of tooth spacing, contour and helix angle . . . qualities inherent in the Farrel-Sykes method of gear generation. Precision manufacture and highest grade materials contribute to long gear life.

STANDARD IN PRINCIPAL FEATURES BUT ADAPTABLE IN CRITICAL DETAIL

Farrel speed reducers have been developed for continuous, trouble-free operation under difficult service conditions. Gears, shafts and bearings are factored to safeguard against interruption of vital processes; gear cases are proportioned to withstand repeated heavy peak loads; joints are sealed to prevent entrance of dust and dirt.

But, that is not all. Without sacrificing the advantages of general standards, the design of these units permits an engineering freedom in proportioning gears, shafts, bearings and even some housing dimensions to meet specific load, speed and service requirements. This flexibility allows an engineering exactness in critical detail, which has resulted in the solution of innumerable application problems.

Write for further details. Ask for a copy of Bulletin 449—no cost or obligation.

FARREL-BIRMINGHAM COMPANY, INC. • ANSONIA, CONNECTICUT

Plants: Ansonia and Derby, Conn., Buffalo, N. Y. *Sales Offices:* Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Cleveland, Cincinnati, Detroit, Chicago, Los Angeles, Tulsa, Houston, New Orleans.

FB-592-A

Farrel-Birmingham®

MONSANTO Expands

PHOSPHATE ROCK on Monsanto properties in Idaho will be strip-mined. Veins are as much as 100 feet thick.

Monsanto, already the world's largest producer of elemental phosphorus, has added extensive holdings of phosphate rock near Soda Springs, Idaho. To extract elemental phosphorus of better than 99.9% purity from this rock, Monsanto is constructing a large electric furnace plant at Soda Springs, Idaho.

The output of this furnace plant, available next year, will substantially increase Monsanto's production of elemental phosphorus. It will mean more phosphoric acid and its derivatives for myriad industries using such products.

Elemental phosphorus from the Soda Springs furnace plant will travel by rail to Monsanto plants in Monsanto, Illinois; St. Louis, Missouri; Trenton, Michigan; and Anniston, Alabama; where it is converted into pure phosphoric acid and numerous phosphates serving hundreds of industries. Expansion of manufacturing facilities at these processing plants is under way.

SINCE 1937, Monsanto has been producing elemental phosphorus at its Monsanto, Tennessee, plant and today there are six large electric furnaces in the Monsanto, Tennessee, installation shown at the left. Monsanto originated the present-day method of large-volume elemental phosphorus production and was the first to ship the element in tank-car quantities.

Phosphorus Production

MORE PHOSPHORUS = MORE PHOSPHORIC ACID
MORE PHOSPHATES
MORE PHOSPHORUS DERIVATIVES

Phosphorus Pentoxide

Phosphorus burned in dry air produces phosphorus pentoxide from which these products are derived:

- Methyl Phosphoric Acid
- Ethyl Phosphoric Acid
- Propyl Phosphoric Acid
- Butyl Phosphoric Acid
- Amyl Phosphoric Acid

Phosphorus Trichloride

Phosphorus plus chlorine produces phosphorus trichloride from which the following are derived:

- Triethyl Phosphite
- Phosphorus Oxychloride
- Triethyl Phosphate
- Tributyl Phosphate
- Trioctyl Phosphate
- Tricresyl Phosphate
- Triphenyl Phosphate

PHOSPHORIC ACID

Phosphorus burned in moist atmosphere produces phosphoric acid used in various industries and from which sodium phosphates, calcium phosphates, ammonium phosphates, potassium phosphates and numerous other phosphates are derived.

SODIUM PHOSPHATES

Mono Sodium Phosphate
Uses:
Acid Cleaners
Water treatment
Textiles

Di Sodium Phosphate
Uses:
Cheese
Leather
Textiles
Detergents
Water treatment
Dye
Pigments

Tri Sodium Phosphate
Uses:
Water softening
Detergent
Metal cleaning
Water treatment
Textiles

Tetra Sodium Pyrophosphate
Uses:
Soap
Textiles
Detergents
Clay dispersant
Dyeing
Bleaching
Pitch control
Metal cleaning
Oil well drilling
Water treatment
Water softening
Glass

Sodium Acid Pyrophosphate
Uses:
Baking powder
Oil well drilling
Electroplating
Prepared flour

CALCIUM PHOSPHATES

Mono Calcium Phosphate
Uses:
Baking powder
Self-rising flour
Self-rising corn meal
Prepared flour
Food enrichment

Di Calcium Phosphate
Uses:
Tooth paste
Tooth powder
Food enrichment
Pharmaceutical

Tri Calcium Phosphate
Uses:
Tooth paste
Tooth powder
Anticaking agent
Food enrichment
Pharmaceutical

Tetra Calcium Pyrophosphate
Uses:
Food enrichment
Pharmaceutical

Sodium Polyphosphate
Uses:
Oil well drilling
Textiles
Water treatment
Detergents

Sodium Tripoly Phosphate
Uses:
Detergents
Pitch control
Metal cleaners
Water treatment
Clay dispersant

PHOSPHORIC ACID

Uses:
Soft drinks
Rustproofing
Metal cleaning
Gelatin
Jelly and preserves
Silage treatment
Fertilizer
Textiles
Sugar
Pharmaceutical
Water treatment

AMMONIUM PHOSPHATES

Mono Ammonium Phosphate
Uses:
Flameproofing
Yeast
Malt
Plant nutrient
Acid cleaners

Di Ammonium Phosphate
Uses:
Flameproofing
Yeast
Plant nutrient
Ammoniated dentifrices

POTASSIUM PHOSPHATES

Mono Potassium Phosphate
Uses:
Pharmaceutical
Plant nutrient

Di Potassium Phosphate
Uses:
Fermentation
Pharmaceutical
Nutrient solutions

Tri Potassium Phosphate
Uses:
Oil refining

Tetra Potassium Pyrophosphate
Uses:
Soap
Textiles
Water softener
Synthetic rubber manufacture

OTHER PHOSPHATES

- Iron Phosphates
- Magnesium Phosphates
- Aluminum Phosphates
- Barium Phosphates
- Beryllium Phosphates
- Copper Phosphates
- Lead Phosphates
- Lithium Phosphates
- Silver Phosphates
- Zinc Phosphates

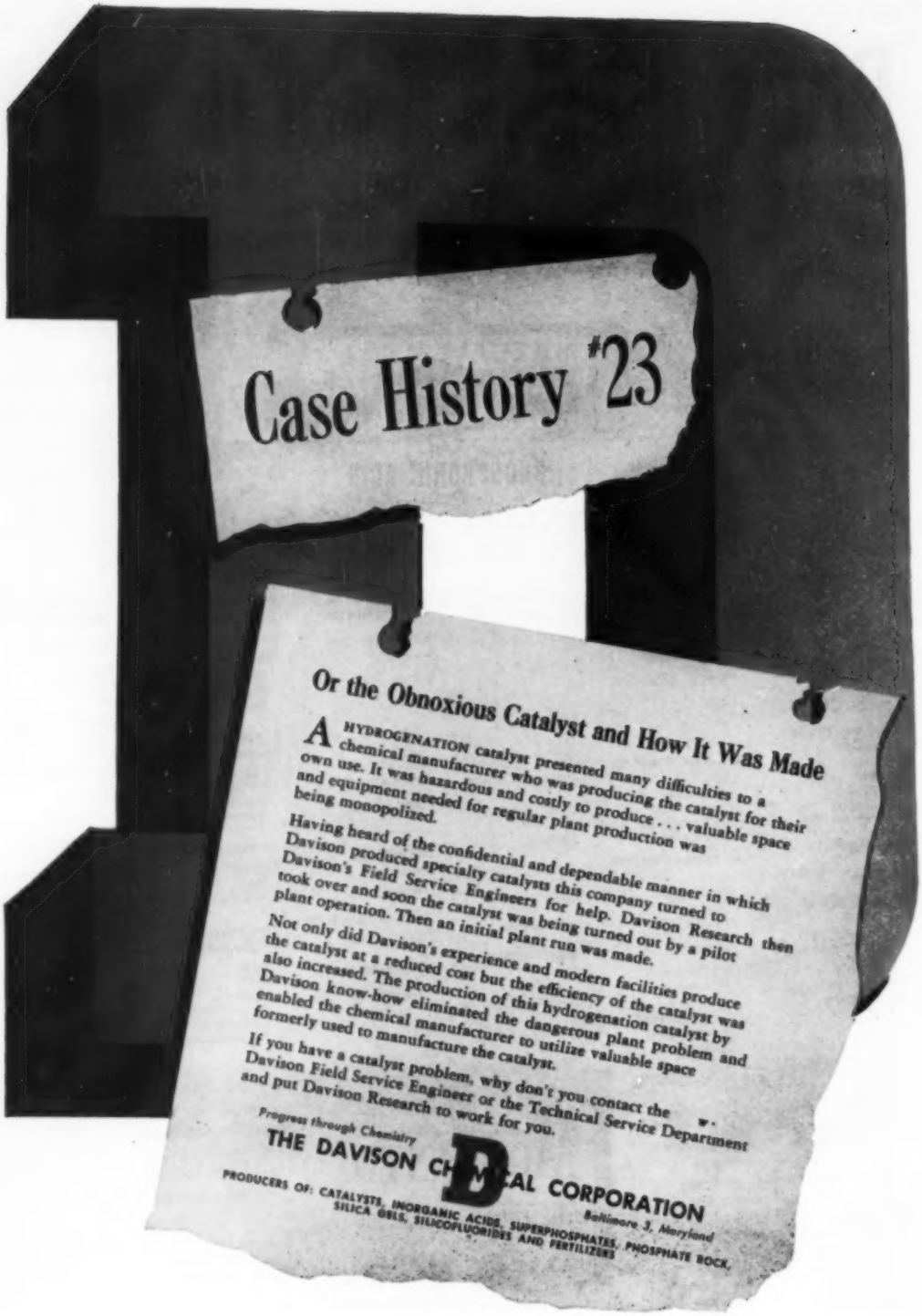
MONSANTO
CHEMICALS—PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

FOR INFORMATION on Monsanto's chemically pure phosphoric acid and phosphates, contact the nearest Monsanto Sales Office or write MONSANTO CHEMICAL COMPANY, Phosphate Division, 1700 South Second Street, St. Louis 4, Missouri.

☆ ☆ ☆

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.


Case History #23
Or the Obnoxious Catalyst and How It Was Made
A HYDROGENATION catalyst presented many difficulties to a chemical manufacturer who was producing the catalyst for their own use. It was hazardous and costly to produce . . . valuable space and equipment needed for regular plant production was being monopolized.
Having heard of the confidential and dependable manner in which Davison produced specialty catalysts this company turned to Davison's Field Service Engineers for help. Davison Research then took over and soon the catalyst was being turned out by a pilot plant operation. Then an initial plant run was made.
Not only did Davison's experience and modern facilities produce the catalyst at a reduced cost but the efficiency of the catalyst was also increased. The production of this hydrogenation catalyst by Davison know-how eliminated the dangerous plant problem and enabled the chemical manufacturer to utilize valuable space formerly used to manufacture the catalyst.
If you have a catalyst problem, why don't you contact the Davison Field Service Engineer or the Technical Service Department and put Davison Research to work for you.
Progress through Chemistry
THE DAVISON CHEMICAL CORPORATION
Baltimore 3, Maryland
PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS, SILICOFLUORIDES AND FERTILIZERS

no ONE chain serves every purpose

This Link-Belt universal crescent flat top chain travels around vertical curves, as well as the sharp horizontal bends shown here, in the Cranford, New Jersey plant of Johnson & Johnson. Jars of Baby Cream take this irregular path so that they cool properly before being capped, each always riding separately on its own chain top plate.

LINK-BELT offers the RIGHT chain for every job . . . engineered to meet your requirements

Typical conveyor chains from the complete Link-Belt line

S-815 flat top conveyor chain—economical, sturdy, reliable, easy to detach and to keep clean.

Class 400 swivel chain—carries cartons, cases, etc. over paths with both vertical and horizontal turns.

Class RC flat top chain—precision made for smoothest, spill-free carrying and long life.

Class RC crescent flat top chain—travels in horizontal planes, around corners; ideal for bottles and cans.

Link-Belt offers no single "cure-all" chain to handle every job. From the most complete line of chains and sprockets in the world—we can recommend the *exact* type to fit your particular job requirements—cast, combination, forged and fabricated steel, roller or silent for conveying and power transmission service. So, whatever your chain problems, big or small, Link-Belt engineers will work with you or your consultants to help solve them.

LINK-BELT COMPANY, Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities.

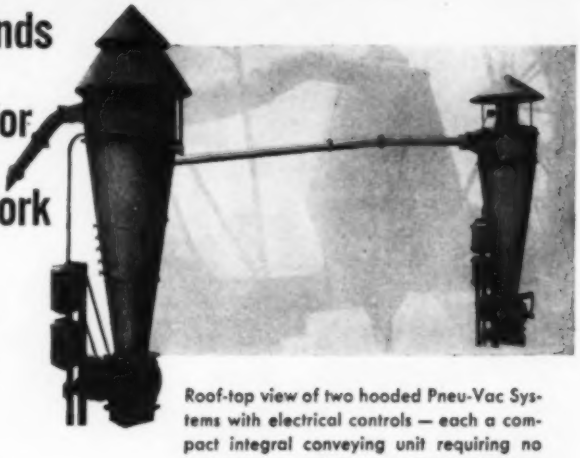
12,200-E

LINK-BELT

CHAINS AND SPROCKETS

S W pointers to BETTER PROCESSING

Crown Cork and Seal Finds PNEU-VAC Ideal for Conveying Granulated Cork



Roof-top view of two hooded Pneu-Vac Systems with electrical controls — each a compact integral conveying unit requiring no maintenance and taking but little installation space.

PROBLEM: The Crown Cork and Seal Company, Baltimore, Md. faced costly operating problems—due to obsolete mechanical conveying equipment. The only answer was major repairs or complete replacement.

A careful study revealed that two Sprout-Waldron pneumatic handling systems could carry the same load in one-fourth the space... at half the cost for an overhaul job. So, Pneu-Vac replaced four old channel flight conveyors.

Compact basement installation shows two 4" Pneu-Vac pipelines which take away cork granules from under dryer. Each Pneu-Vac handles 3,000 lbs. of cork per hour.

The odds overwhelmingly favored Pneu-Vac on other counts, too:

(1) It's compact—easy-to-get-at.

(2) It removes heat and dust—improves working conditions.

(3) Cork granules are air-conveyed without disintegration.

(4) Maintenance cost is *way* down.

RESULTS: *Mr. F. L. Good, project engineer at Crown Cork and Seal has this to say about PNEU-VAC:*

"Our Pneu-Vac System has eliminated two complete mechanical handling systems with no reduction in our original production schedule of 6,000 lbs. of granulated cork per hour.

"We consider this the outstanding step forward in ten years, and appreciate the opportunity to show this system in operation."

KEEP AHEAD OF COMPETITION WITH SPROUT-WALDRON EQUIPMENT

199-A

S W

pointers to BETTER PROCESSING

Streamlined Materials Handling of Bulk Chemicals

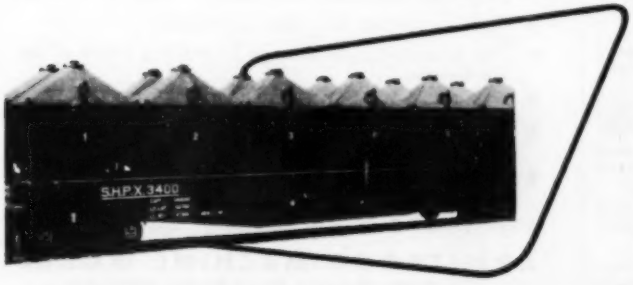
For years calcium carbide, used in acetylene and synthetics, was shipped in 1000 lb. steel drums. Loading a shipment of carbide was slow, arduous work, eating up plenty of man-hours. Depreciation on drums due to rough handling was especially high. And, loss through spillage was an evil accepted by both manufacturer and consumer.

The growing demand for carbide by large industrial users necessitated a more efficient, economical method of handling carbide in bulk.

The SOLUTION: A five-ton capacity, all-steel, air-tight portable container which discharges directly to the acetylene generator. Units can be nested by the dozen on flat cars or loaded on trucks in sets of three.

RESULT: Each container holds 10 times more carbide... is filled, sealed, and moved mechanically with lowest costs ever!

Sprout-Waldron built over 2500 of these specially designed containers. Why not take advantage of this wealth of experience? We can also *help you* cut corners in the moving of bulk chemicals.



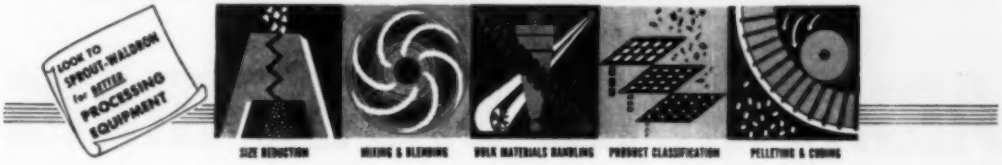
For further information about this equipment write to Sprout, Waldron & Co., Inc., 15 Waldron St., Muncy, Pa.

Sprout-Waldron

Manufacturing Engineers

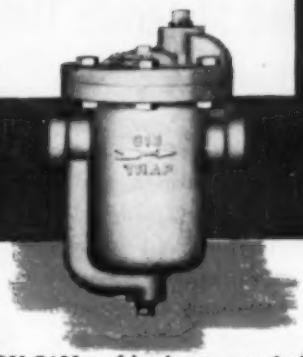
SINCE 1866

MUNCY • PENNSYLVANIA



THE EVIDENCE IS OVERWHELMING!

ARMSTRONG TRAPS
GIVE UNEQUALLED RESULTS



NEED FOR NEW BOILER ELIMINATED after installing Armstrong traps on canning equipment . . . *Bestovall Canning Co., Vancouver, B. C.*

50% DECREASE IN HEAT-UP TIME of plating coils . . . *Proctor Electric Co., Philadelphia, Pa.*

15% GREATER PRODUCTION since unit trapping with Armstrongs . . . *Sun Ray Cleaners, Chicago, Ill.*

NO REPAIRS IN SIX YEARS ON 250 Armstrong traps . . . *Plymouth Shoe Co., Middleboro, Mass.*

20% FUEL SAVINGS after trapping heating coils individually . . . *Norton Greenhouses, St. Paul, Minn.*

SAVING 14 TONS COAL PER MONTH with Armstrong traps . . . *M. Wile & Company, Buffalo, N.Y.*

30% LESS MAINTENANCE on traps on low pressure heating system . . . *John Deere Harvester Works, East Moline, Ill.*

BETTER QUALITY WORK since trapping laundry equipment with Armstrongs . . . *Soft Water Laundry & Cleaners, Long Beach, Cal.*

40° HIGHER TEMPERATURES in flatwork ironer rolls . . . *Peter Bent Brigham Hospital, Boston, Mass.*

40 MINUTES FASTER HEAT-UP in drying oven since Armstrong traps were installed . . . *Emerson Drug Co., Baltimore, Md.*

DRIER HEAT-UP TIME CUT 2-3 HOURS with six Armstrong traps . . . *Industrial Grain Products, Fort Williams, Ontario.*

SAVES 3728 GALLONS FUEL OIL first year Armstrong traps were installed . . . *Mary Lincoln Candies, Buffalo, New York.*

YOU CAN confidently *expect* results like those listed at the left when you install Armstrong steam traps because:

- No steam loss, hence steam and fuel savings and less return line back pressure.
- Air is vented automatically along with condensate, assuring maximum temperature, less corrosion.
- Valve and seat are chrome steel, hardened, ground and lapped—good for temperatures to 900°F, 950 psig, they last for a long, long time at lower pressures.
- Valve lever assembly and bucket are 18-8 stainless for long wear and corrosion resistance.
- Nothing to stick, clog, leak or collapse.
- Dirt is washed right through by swirling action of the condensate.
- There is almost no friction between moving parts.
- The valve is either wide open or tight closed—no wire-drawing, no dribbling, less wear.
- Condensate is discharged at steam temperature, keeping units at top temperature.

Why have less? Order your Armstrong traps now.

ARMSTRONG MACHINE WORKS
856 Maple Street • Three Rivers, Michigan

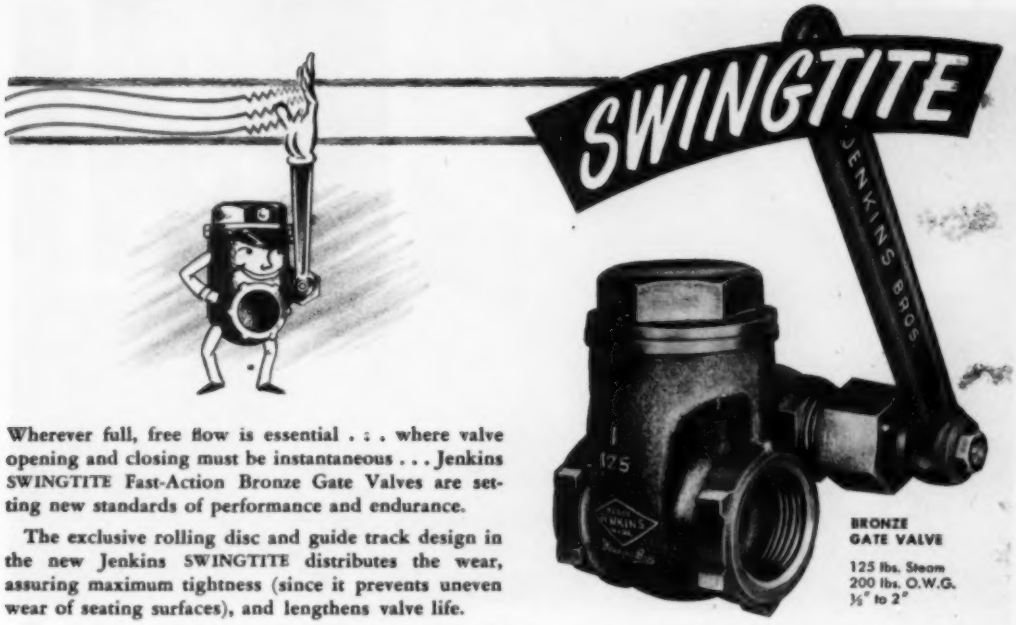
SEND FOR THE 36-PAGE STEAM TRAP BOOK FOR COMPLETE DETAILS

SEE OUR CATALOG IN SWEETS OR CEC

ARMSTRONG STEAM TRAPS

Specify this Fast-action Gate for quick, sure STOP and GO services

JENKINS



BRONZE
GATE VALVE
125 lbs. Steam
200 lbs. O.W.G.
⅛" to 2"

Wherever full, free flow is essential . . . where valve opening and closing must be instantaneous . . . Jenkins SWINGTITE Fast-Action Bronze Gate Valves are setting new standards of performance and endurance.

The exclusive rolling disc and guide track design in the new Jenkins SWINGTITE distributes the wear, assuring maximum tightness (since it prevents uneven wear of seating surfaces), and lengthens valve life.

Use the SWINGTITE wherever fast-action valves take a beating on your processing lines. Compare it for long life and low maintenance. Prove for yourself that day after day it opens freely for full flow, and, closed, it seats tight and *stays* tight.

Ask your Jenkins Distributor for the folder, Form No. 196, describing the SWINGTITE in detail. Or write: Jenkins Bros., 100 Park Ave., New York 17; Jenkins Bros., Ltd., Montreal.

SOLD THROUGH LEADING INDUSTRIAL DISTRIBUTORS

SETTING NEW RECORDS FOR LONG LIFE AND LOW MAINTENANCE IN

- Oil refineries
- Textile finishing plants
- Chemical and food plants
- Pulp and paper mills
- Mines and mineral refining

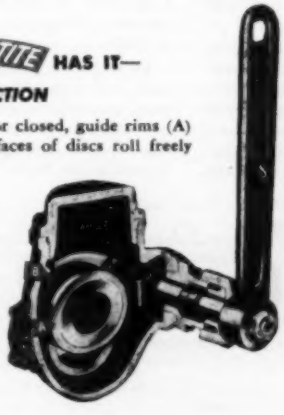
AND IN SUCH APPARATUS AS

- Laundry machinery
- Dish-washing equipment
- Gasoline and fuel oil lines on motors, burners, etc.
- Fire extinguishing steam lines

ONLY THE SWINGTITE HAS IT—

ROLLER ACTION

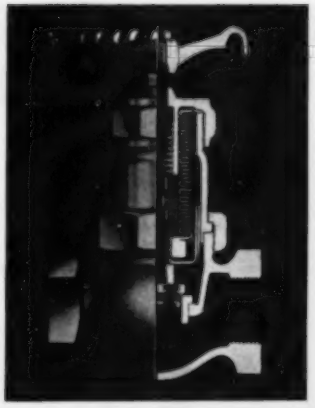
As the valve is opened or closed, guide rims (A) around the seating surfaces of discs roll freely over guide tracks (B) cast in the body, distributing wear evenly, dislodging foreign matter, and providing a polishing action for seating surfaces. This rolling disc and track construction lengthens valve life and assures maximum tightness.



JENKINS VALVES
LOOK FOR THE DIAMOND MARK
SINCE 1864 TRADE JENKINS MARK

Jenkins Bros

No. 304-N Sylphon Packless Valve. Sizes from ½" to 2" for pressures up to 150 pounds. Larger sizes available. For vacuum service, No. 304-NV is ideal.



Valve with a leak-proof heart —saves your gases and liquids!

PICTURED HERE is one of the many exacting tests Sylphon Packless Valves must pass, to make sure they're leak-proof. For when they're installed on pipe lines carrying gas, oil or other volatile liquids or vapors, it's their job to prevent even tiniest leaks—in or out!

You can see the savings that makes—in preventing waste, in providing vacuum protection. And Sylphon Packless Valves give you *safety* features, too. They help guard you and your equipment against dangers of hazardous liquids or gases . . . are extra protection against explosion, fire and other damage.

It's the "heart" of the valve that turns the trick—the rugged, seamless Sylphon metal bellows that replaces customary packing. The bellows eliminates leaks that might seep past the stuffing box of even the best packed-type valve. It seals the valve stem against corrosive, dangerous or inflammable liquids or gases.

Sylphon Packless Valves come in many sizes and types—in brass, monel, stainless steel, etc. Widely used in chemical plants, oil refineries, power plants, aboard ships. Ideal as standard equipment. For complete information, write for Bulletin RC-813.

FS

FIRST WITH BELLOWS

Temperature Controls • Bellows Devices • Bellows Assemblies

FULTON SYLPHON
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ROBERTSHAW FULTON CONTROLS CO. KNOXVILLE 4, TENN.

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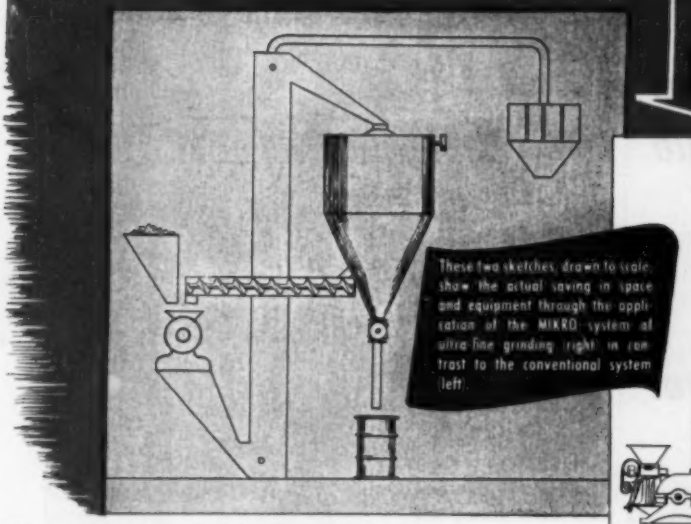
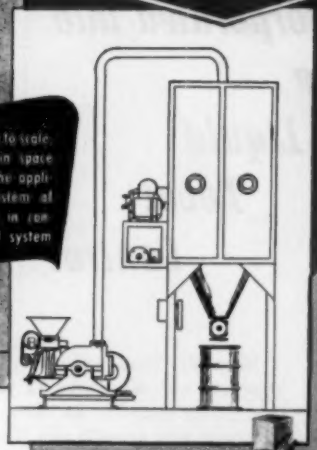
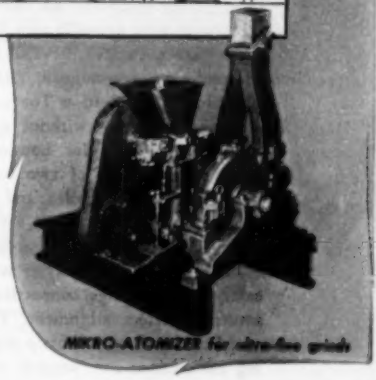
SAVE AND SIMPLIFY

By this Process of ELIMINATION and REDUCTION


These two sketches, drawn to scale, show the actual saving in space and equipment through the application of the MIKRO system of ultra-fine grinding (right) in contrast to the conventional system (left).





The MIKRO-ATOMIZER • • •

ELIMINATES: **Air Separator— Bucket Elevator — Screw Conveyor**

REDUCES: **Headroom — Floor Space — Extra Handling or Equipment**

If your need is for ultra-fine grinds requiring air classification rather than screening, the MIKRO-ATOMIZER is your complete answer. It is an entire system producing perfectly blended grinds in the lower micron range in a single pass at exceptionally low temperature rises . . . . . A 3-function machine eliminating much of the accessory equipment used in conventional systems.

With its built-in air separator, the MIKRO-ATOMIZER simplifies the flow chart by grinding, air-classifying and conveying in one operation. And its 3-function service is reflected in 3-fold saving:—lower initial and maintenance costs . . . lower cost of production per hp/hr as compared with conventional systems . . . substantial economy in operating space, or in construction costs if you are planning a new building.

Slight adjustments in the MIKRO-ATOMIZER permit varying degrees of fineness. If necessary you can actually produce two degrees of fineness in one operation.

If you have ultra-fine grinding problems don't fail to investigate this 3-function MIKRO.

SEND FOR **special MIKRO-ATOMIZER bulletin**

Other members of the MIKRO "family:"

The MIKRO-PULVERIZER
—for granular or fine grinds.

The MIKRO-COLLECTOR
—for general air clarification and saving material thru adequate dust control.

1130

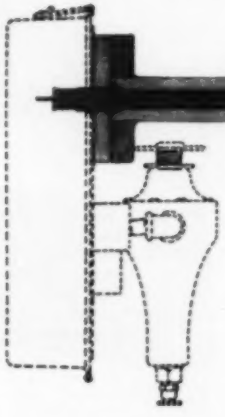
MIKRO-PULVERIZER (FINE)
-ATOMIZER (ULTRA FINE)
Reg. U. S. Pat. Off.
Also Makers of the MIKRO-COLLECTOR

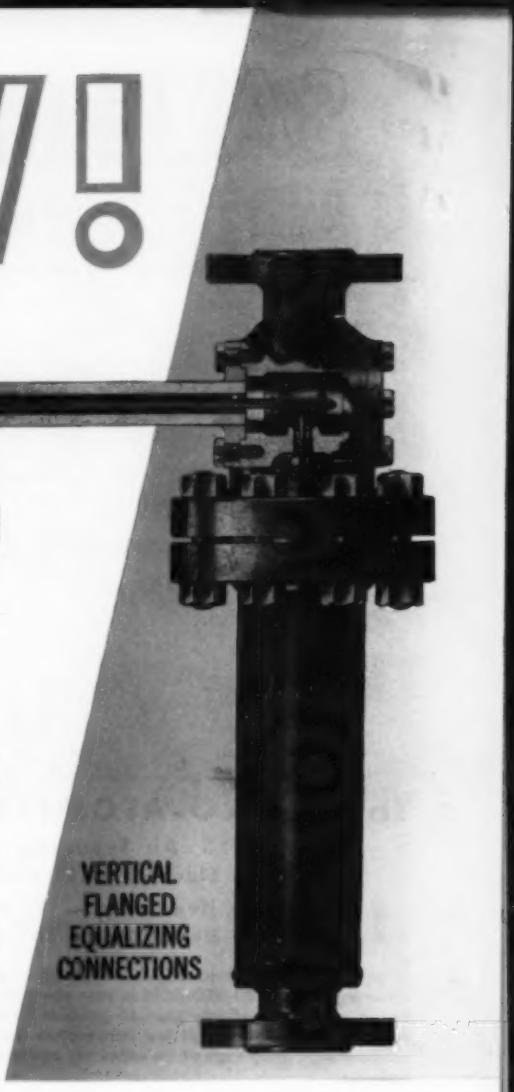
PULVERIZING MACHINERY COMPANY
55 Chatham Road **Summit, New Jersey**

PRESERVE OUR HERITAGE: FAITH, FREEDOM AND INCENTIVE

NEW!

...all these features incorporated into one Liquid Level Control





Naturally, BS&B "Climax" would build this new Type 888 with more than 12 years' development and field testing behind it. Exclusive, patented features . . . integrated with versatile new ideas, have resulted in • New CONE POINT PIVOT, reduces bearing friction to minimum. It's rugged, friction-free and easily replaceable in the field • Torque tube housing is removable and reversible without special tools and without dismantling Controller housing • Reversible feature permits installation of two torque tube housings and two pilots and/or pilot and mercury switches. This means simultaneous liquid level control and alarm or emergency circuit operation • Smaller cage housing reduces weight, but heavier walls and flanges increase safety All flange connections are male and female, assuring perfect alignment. Tighter connections with metal-clad gaskets • Obtain any combination of equalizing connections . . . vertical or horizontal or combinations of the two.

For new, fully illustrated catalog, write today for the new BS&B "Climax" Type 888 Liquid Level Controller Section 103.

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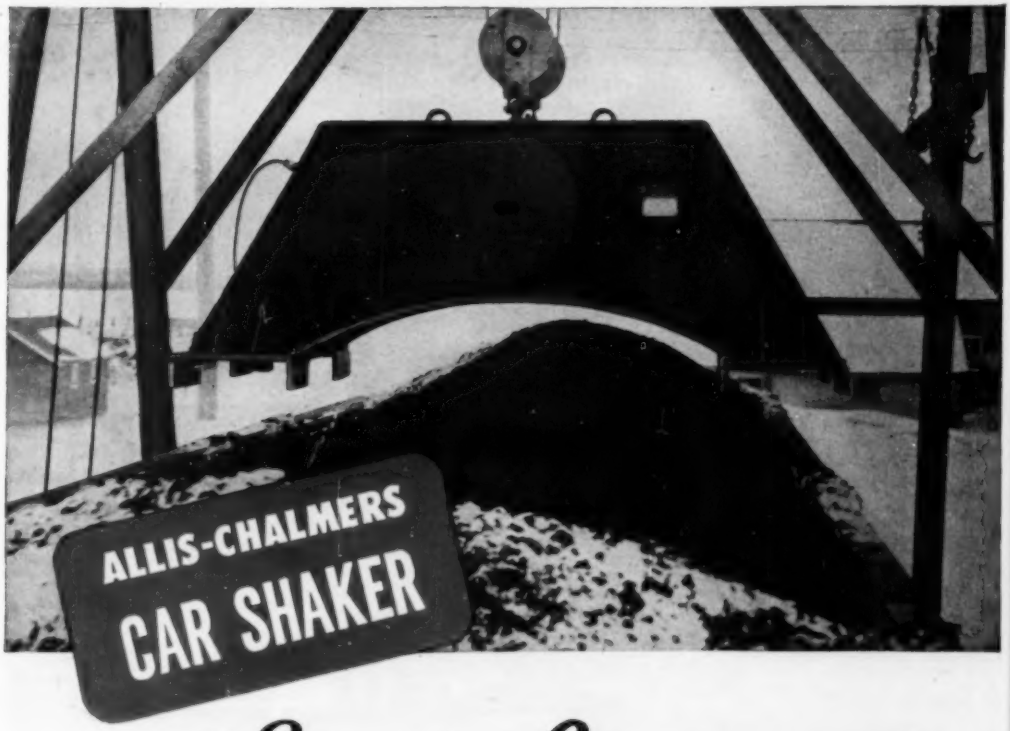
CONTROLS

FAST UNLOADING



...and Sturdy Construction

BESIDES BIG SAVINGS in man-hours and demurrage costs, operators report savings in maintenance and downtime with Allis-Chalmers car shakers. And no wonder! Allis-Chalmers has designed these units for long, dependable service without trouble. For example:

- Shaker body is one-piece, all-welded structure made of 1 in. thick reinforced steel plate and stress-relieved to eliminate welding strains.
- Motor and drive are totally enclosed within shaker body, protected from weather and accidental injury. Motor is mounted in a special cradle base and protected from vibration damage with multiple shear mountings.
- Extra large bearing — 11⅞ in. outside diameter. Long bearing life! Heavy duty shaft arranged for hydraulic bearing removal.

Get more facts about how Allis-Chalmers car shakers can save money in your operations. Call the A-C representative in your area. Allis-Chalmers, Milwaukee 1, Wisconsin.

Car Shakers Promote Safety to Personnel!

ALLIS-CHALMERS

Allis-Chalmers Mfg. Co,
Milwaukee 1, Wis.

Please send my copy of Car Shaker Bulletin 07B7221A.

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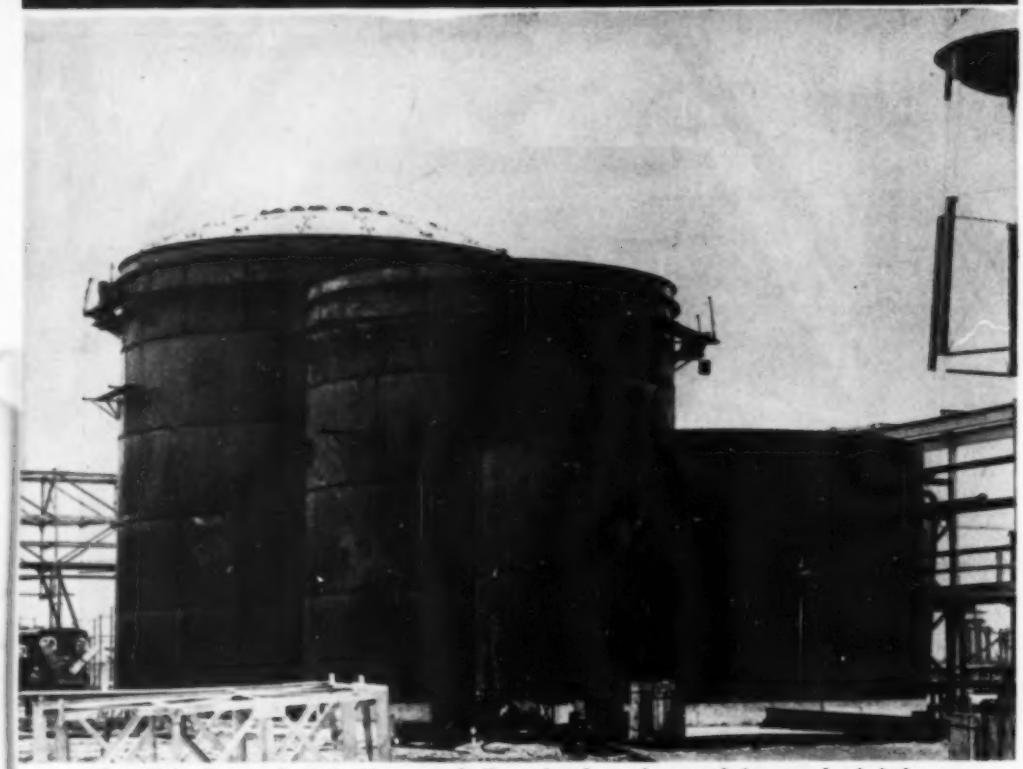
A-3448

3 Steps toward Better Tank Construction



Three 90-ft. diameter by 40-ft. Horton umbrella roof tanks nearing completion at a chemical plant.

Welded Steel Tanks Mean Better Chemical Storage

Illustrated above are three Horton flat-bottom welded steel tanks in various stages of construction. We have since completed the erection of these tanks for a large chemical company in Texas for the storage of ethylene dichloride and ethylene glycol.

Horton tanks offer many advantages for chemical storage: (1) Welded steel construction means tight, durable joints; (2) Smooth surfaces eliminate pockets that breed corrosion; (3) Maintenance is simple, and regular painting keeps Horton tanks in top operating condition.

Remember too, that when corrosion is a problem we are fully equipped to fabricate chemical storage tanks of corrosive resistant alloys and metals. Many chemical companies are successfully using tanks made of monel, nickel, aluminum, straight chrome stainless and everdur.

When you specify Horton tanks for chemical storage you assure yourself of the finest in design, fabrication and erection services. Take advantage of this extra margin of quality and put it to work for you on your next storage tank requirements. For information and quotations write our nearest office. There is no obligation on your part.

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Atlanta 3 ..... 2120 Healey Bldg.
Birmingham 1 ..... 1510 North Fiftieth St.
Boston 10 ..... 1005—201 Devonshire St.
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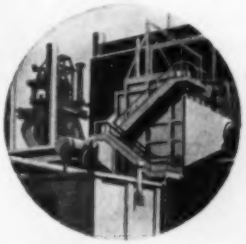
Cleveland 15 ..... 2220 Guildhall Bldg.
Detroit 26 ..... 1503 Lafayette Bldg.
Houston 2 ..... 2103 National Standard Bldg.
Los Angeles 17 ..... 1505 General Petroleum Bldg.
New York 6 ..... 3318—165 Broadway Bldg.
Philadelphia 3 ..... 1625—1700 Walnut St. Bldg.
Salt Lake City 1 ..... 1305 First Security Bank Bldg.
San Francisco 11 ..... 1222—22 Battery St. Bldg.
Seattle 1 ..... 1305 Henry Bldg.
Tulsa 3 ..... 1623 Hunt Bldg.
Washington 6 ..... 1160 Cafritz Bldg.

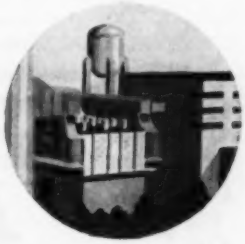
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

War on waste!

American industry is continually searching for new ways to stop waste and increase production and efficiency. A good example of this is the Koppers-Elex electrostatic precipitator. Shown below are a few typical ways industry uses them to combat waste . . .



BLAST FURNACE GAS must be cleaned before it can be used as a fuel. Koppers-Elex electrostatic precipitators clean this gas to residuals as low as .002 grain per cubic foot.



FLUE GASES from recovery boilers in pulp mills contain valuable materials. Koppers-Elex electrostatic precipitators recover several hundred thousand dollars worth of these materials yearly.

FLY ASH from power plants and factories may drop a blanket of dust extending three to five miles. Koppers-Elex electrostatic precipitators stop this nuisance and preserve public good will.

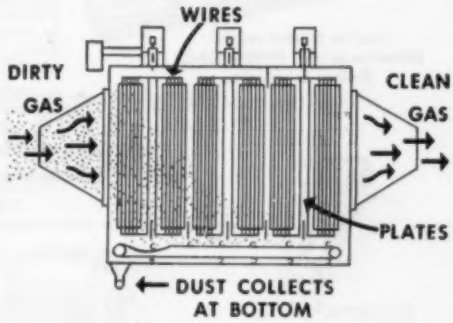
Guaranteed: All Koppers-Elex electrostatic precipitators are guaranteed to equal or better (under tests made by your own personnel) any efficiency or residual content you specify.

ENGINEERS! You should know about these six design features of Koppers-Elex electrostatic precipitators!

KOPPERS has made sweeping improvements in electrostatic precipitator design! For example, double chambers eliminate expensive by-pass systems and the resultant loss of materials during inspection or maintenance. And re-entrainment is sharply reduced because rapping is sectionalized.

Successive collection zones are separately energized to provide maximum voltage for highest collection. And because each field is, in effect, a separate precipitator, the outage of one field *does not stop* gas-cleaning action. In addition, completely enclosed and compact "package" mechanical or vacuum tube power packs simplify installation and operation.

Another exclusive Koppers feature is the drag scraper which provides continuous dust removal, eliminates plugged hoppers and prevents bothersome dust build-up. For detailed information on recovery, gas-cleaning or nuisance abatement results write today to: Koppers Company, Inc., Precipitator Dept., 219 Scott Street, Baltimore 3, Md.



If you have a gas-cleaning problem, write today to: Koppers Company, Inc., Precipitator Dept., 219 Scott St., Baltimore 3, Md.

KOPPERS

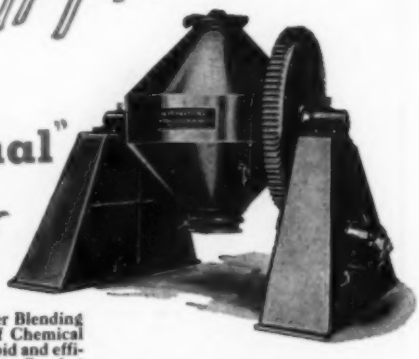
Koppers-Elex ELECTROSTATIC PRECIPITATORS

Adapted to your Product

SPECIALLY ENGINEERED

In the constant search for new ways to Reduce Costs and Improve Production—keeping ahead of demand—we believe you can profit by the experience of many important manufacturers who are using INTERNATIONAL EQUIPMENT to (1) Minimize labor and handling operations—(2) Reduce costs, space and weight—(3) Meet exact mechanical and chemical requirements—(4) Improve the finished product.

"International" DRY BLENDERS



The Standard of Lower Blending Costs for Hundreds of Chemical Products. For more rapid and efficient blending of any free flowing solid ranging from very fine mesh powder to large pebbles—particularly for the intimate mixing of pigments, colors and dyestuffs—Resin and plastic powders—Pharmaceuticals and medicinals—Food and grain products—Photographic materials—Fine and heavy chemical powders—Fertilizers—Ore or metallurgical products. *Made in many types and sizes*, ranging in capacity from 25 to 10,000 lbs. for materials having densities of from 20 lbs. to 100 lbs. per cubic foot.

"International" RIBBON MIXERS

Send for Catalogs and Full Information on any "INTERNATIONAL" Product—no obligation.

Made in 4 different Drive Arrangements, and in 16 Standard Sizes, from ¼ to 175 cubic ft. capacity. Special Designs also available to meet specific floor space and other requirements. "INTERNATIONAL" RIBBON MIXERS are so fitted with a design relationship, outer to inner spirals, and the efficiency is such as to thoroughly mix a few ounces of one material with many pounds of another material. Heavy all welded construction. SIMPLIFIED AGITATOR REMOVAL—By simply removing bolts from companion flanges, the entire shaft containing the two spirals can be lifted out of the mill.

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TOP ENTERING MIXERS

BALL MILLS

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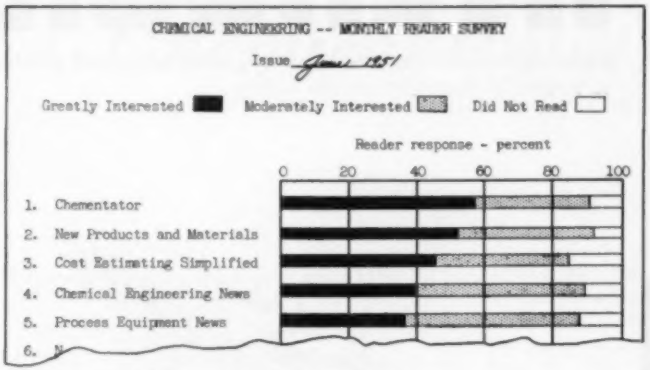
PORTABLE MIXERS

Memo from the Editor John R. Callaham



Your Memos to Me . . .

. . . are fast becoming statistics that are helping us tailor CE more to your liking. Here's your chance to tell us exactly what you think of the job we're doing—without pulling any punches.

Back in July a young design engineer in Philadelphia took time out to pass along an idea I thought was pretty good.

"Why," he jotted down on the margin of one of my questionnaires, "don't you give all your subscribers a chance to comment on CE more often? Something, maybe, like a short questionnaire in the magazine itself?"

Well, that's exactly what I'm doing now. And I sincerely hope a lot of you will take off a few minutes and jot down your comments on the memo blank at the bottom of this page. Then just cut it out and mail to me.

Before you do this, though, I'd like to tell you a little about why I value your comments so, what we do with them and how they help us to do a better job for you.

Close to a couple of years ago I started sending out questionnaires to a rotating sample of about 1,000 of you every month. On this form I ask you to check the degree of interest you found in each article and each editorial department in that month's issue of CE.

Your returns (which have been really gratifying) give us a pretty clear-cut idea of exactly what you like and what you don't like in each issue. In fact, we plot your answers (cut above shows a sample on our June issue) and study them closely.

Very often the results take us by surprise. But we always try to figure out the whys behind the high popularity of one article, the low popularity of another.

The big payoff for us, however, comes when we plot the averages of the monthly figures for six months or a year. Then we really begin to see the pattern of your likes and dislikes —many of which we never realized before.

Then we have an all-day staff meeting (we had one a few weeks ago) and decide on what to shoot at for the next six months. That's your payoff for taking the time and effort to keep us posted on what you want.

So, if you think we're making CE a better publication, it's all because we're taking your memos seriously and are converting them into statistics—points and plots that are serving more and more as our editorial guides.

There's only one thing, I believe, that's wrong with the check-list system we've been using on our monthly questionnaires: it's too impersonal, doesn't give you enough opportunity to speak your minds. I feel it's a healthy thing for us "to see oursels as ithers see us"—and you're the only ones that can hold up that mirror!

Those are the reasons, then, why I'm inserting this little memo blank. May I have your frank opinions, your candid comments? Don't sign your name if you'd rather not. Thanks a lot.

MEMO TO JOHN CALLAHAM
330 West 42nd St., New York 18, N. Y.

FROM _____
(Title or Job Function) _____

What I like best about CE: _____

What I like least about CE: _____

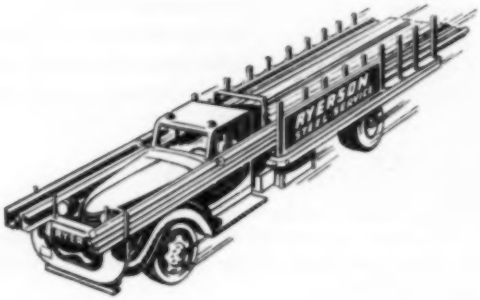
My comments on this issue: _____

RYERSON

Ryerson Steel Service awaits your call at thirteen great plants, strategically placed across the nation.

STEEL

Every kind of steel is on hand for quick delivery. Though stocks are currently unbalanced, most requirements are usually available.



SERVICE

Ryerson representatives are ready to assist you on any problem involving the purchase, fabrication or application of steel.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled and cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot and cold rolled, many types and coatings
TUBING—Seamless and welded, mechanical and boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated. Also tool steel
STAINLESS—Allegheny bars, plates, sheets, tubes, etc.
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SIDNEY D. KIRKPATRICK, Editorial Director JOHN R. CALLAHAM, Editor

Chemical Engineering
WITH CHEMICAL & METALLURGICAL ENGINEERING

SEPTEMBER 1951

Opportunity — by the Billions

Ask a group of average chemical engineers: What's the biggest chemical industry? Their answers will vary widely, depending on whether you stretch "chemical" to include chemical and chemical engineering processes. They will depend, too, on how you measure bigness—whether by dollars of output and invested capital, or by number of plants and employees.

With most of us there is another significant yardstick in the record of research, in the opportunities offered for further growth and development.

By almost any measure, petroleum ranks among the biggest of the process industries. Its refineries will soon be producing each year products worth more than $8 billion. Contrary to popular opinion, these are essentially chemical products. Board Chairman Robert E. Wilson, of Standard Oil (Indiana) is our authority for the statement that 90 percent of today's military aviation gasoline is made by synthetic chemical processes, most of which were unknown even to scientists twenty years ago. Ordinary gasoline contains 60 percent of synthetic molecules not present in the crude oil but produced by chemical synthesis.

The magnitude of petrochemical operations dwarfs all other synthetic chemical processes and products. In his recent Cadman memorial lecture in the Royal Institution in London, Dr. Wilson cited these striking figures [millions of lb. per yr.]:

Organic Chemical Industry Synthetics From Petroleum

All plastics	1,700	Alkylate	16,000
Detergents	330	Alcohols	2,500
Nylon	170	Rubber	1,200

In the last 25 years petrochemicals have increased from less than a tenth of one percent to about 35 percent of all organic chemical production.

Now let's have a look at another giant just beginning to find its place as a chemical process industry.

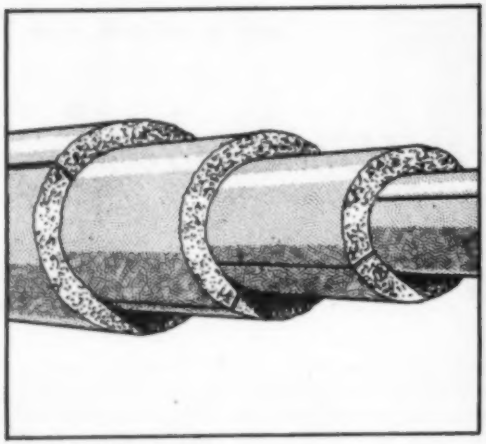
The atomic energy program spent $1.5 billion last year for new plant construction and equipment. Its bill for scientific research and technical development: $282,661,060 in 1950. Last month, for the first time in its history, the Atomic Energy Commission gave us a comprehensive balance sheet and industrial-style accounting of its operations. This shows plant and equipment at a cost of more than $2.1 billion as of June 30, 1950. The operating budget ran to $415 million that fiscal year. AEC and its contractors regularly employ about 100,000 persons and that figure is rapidly increasing. When its new plants are completed, AEC will become the nation's largest single consumer of electricity.

Indicative of the essentially chemical character of the atomic energy program, 95 percent of its employees are on the payrolls of firms that operate this great and growing industry—Carbide, Du Pont, General Electric, Westinghouse, Monsanto, Phillips Petroleum, American Cyanamid, National Lead. Many other engineering and equipment companies also participate in the work of contractors and suppliers.

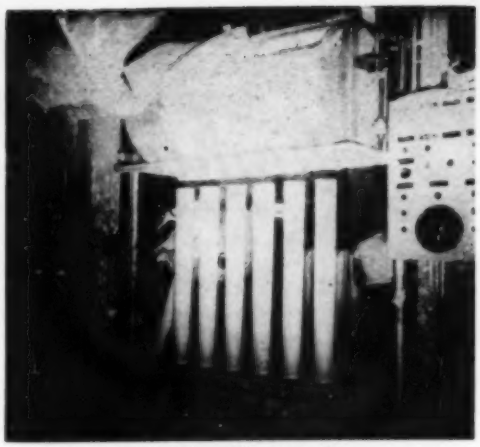
But the most promising portent of greater industrial participation lies in the proposal to build privately owned atomic power plants. Monsanto has teamed with Union Electric of St. Louis, Dow with Detroit Edison, Bechtel with Pacific Gas & Electric, Commonwealth Edison with Public Service of Illinois—all with the intent to produce plutonium for sale to the government and to utilize byproduct power for electrochemical and other industrial uses. Many serious obstacles still confront these proposals, but once the way is cleared by congressional action the chemical industry will have put atomic power to work in a big way for peacetime purposes.

Are petroleum and atomic energy the biggest of the chemical process industries? We are not sure. Again, it depends upon definitions that might include or exclude such fields as food processing or textile operations. But of this we are certain: that opportunities for chemical engineers will continue to multiply as more and more billions are invested in the future of these rapidly growing industries.

Sidney D. Kirkpatrick



Low-density 85% magnesia . . .



. . . is self-set with heat in molds such as this . . .

Better Magnesia Insulation

BETTER BECAUSE: Fewer joints required, handling costs reduced, tight-fitting multiple-layer construction to any desired thickness made possible. Lower conductivity provides greater heat savings.

S. A. ABRAHAMS

A new and better process for the manufacture of 85 percent magnesia is revolutionizing the industry. The fundamental difference between the new and conventional processes lies in the chemistry of the manufacturing process and modern machine molding.

The conventional process is the filter-mold process. Here a solution of magnesium bicarbonate is decomposed to yield crystals of the basic carbonate. These are slurried with asbestos fibers in water and pumped into molds under 30-50 lb. pressure. The formed product containing 80 percent water is removed from the molds and placed on supports on oven cars. Excess water is removed in the drying ovens.

In the new precision self-set process, a needle-like crystal form of magnesium carbonate (the normal carbonate) is produced from the magnesium bicarbonate solution, mixed with asbestos fibers and water, all in proportion to obtain the desired finished density, and cast into precision-sized molds.

Through the application of heat, this mixture is converted into basic hydrated magnesium carbonate. A light but strong monolithic structure is formed. The water removed through evaporation produces an unusually high percentage of dead air space.

Result is a product with a lower conductivity factor, higher strength-weight ratio, and closer tolerances. Controlled density is responsible for high uniformity of physical properties.

SAMUEL A. ABRAHAMS *is division manufacturing manager at the Plymouth Meeting, Pa., plant of Philip Carey Mfg. Co. The new self-set process described in this article was developed under his supervision while he was director of research and operations at the Plant Rubber & Asbestos Works, Emeryville, Calif. The process is being used by four of the six manufacturers of magnesia insulation, including Philip Carey. Pilot-planted in 1939, the process reached commercial stature in 1941. This is the first detailed account to be published.*

The Product

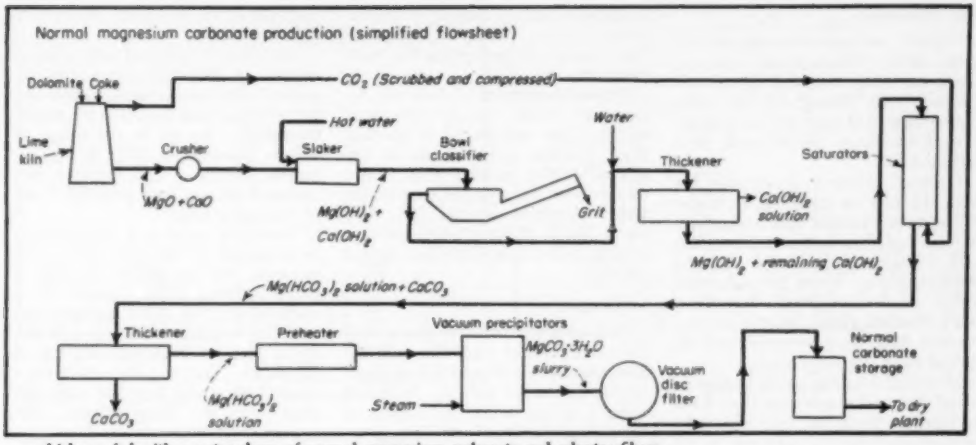
85 percent magnesia insulation is a product of not less than 85 percent basic partially-hydrated magnesium carbonate and 10-15 percent asbestos fibers. It is good for temperatures up to 550-600 deg. F.

Precision self-set 85 percent magnesia differs from and is an improvement over the conventional filter-mold insulation in many important respects.

In the first place, the density of the new product is more closely controlled, making it possible to produce a lighter and more uniform product. It has a density of from 10 to 11 lb. per cu. ft. compared to 13 to 17 lb. per cu. ft. in the filter-molded type. With the lower density goes a lower conductivity factor.

Advantages to the user are immediately apparent. Since the product can be molded sectionally to produce covering for pipe sizes for larger diameters possible or practical in the filter mold process, handling and application cost are materially reduced. For example, two pieces of semi-cylindrical precision self set insulation around an 18 in. pipe will do the job otherwise requiring a multiplicity of small curved blocks. The practical limiting diameter in the filter mold process is 12 in. pipe covering size. Here, with the new product, we have a labor saving feature at the point of application.

However, of equal value and significance, is dimensional stability. After molding, shrinkage during drying is



. . . which are fed with a water slurry of normal magnesium carbonate and asbestos fibers.

by New Process

NEW BECAUSE: First significant development in magnesia insulation field in 50 years. Chemistry of process changed. Key: preparation of needle-like crystals of magnesium carbonate with self-setting properties.

only ¼ of 1 percent. This characteristic enables the manufacturer to produce pipe insulation in extremely accurate sizes. Conventional material is molded considerably oversize because shrinkage and distortion during drying cannot be predicted. Subsequent machining does not permit accuracy to the extent provided by the precision self-set process.

New simplified thickness standards for commercial pipe covering are being established. Accordingly, the outside diameter of every piece of pipe insulation will be made to conform exactly with the outside diameter of standard wrought iron or steel pipe. In this way, precision self-set pipe insulation can be specified to build up any thickness desired by applying successive layers of standard pipe size sections, each making an exact perfect fit over the preceding one—especially important in broken-joint construction.

This would not be practicable with conventional insulation. As a result, there is increased expense both in manufacture and application and large inventory tie-ups in extra-thick specials.

Finally, due to the precision setting of this new product in the molds, both the interior and exterior surfaces are smooth, resembling a troweled finish coat of plaster.

ROLE OF ASBESTOS

Primary purpose of asbestos fiber in any type of magnesia insulation is to serve as a reinforcing agent comparable to that of steel in concrete. It adds little value to the insulating characteristics of the material itself.

85 percent magnesia derives its insulating efficiency from the myriad of air voids or dead air cells within the structure of the product. Asbestos fiber will to some degree occupy part of the space so that in effect it will not improve the insulating efficiency of the product. However, its resistance to heat permits it to retain its strength at higher temperatures. Any type of organic fiber would be subject to destruction or decomposition.

In the matter of the preparation of fiber there is considerable difference of opinion in the industry. We have always maintained that a good medium average length well opened is ideally suited for a magnesia mix. It is necessary to avoid matting or roping in order to provide proper dispersion. Lengths of 0.5-1.0 in. are well suited. However, fibers that are too well opened do not have the necessary bonding strength required to hold the mass of insulation together to the proper degree.

For example, the strength of a piece of string is dependent upon a group of fibers twisted together. When the fibers are completely opened and separated the strength of the string is gone completely. Similarly, this would apply to the over-milling or opening of asbestos fibers. What is more, in the over-milling of asbestos fibers the shorter lengths are ground to dust. This dusting not only reduces the quality and strength of the fiber but coats the outside of the opened fibers thus preventing the best type of bond with the main constituent of the insulation, magnesia.

Since there has not yet been designed and constructed a piece of equipment that will adequately or uniformly open the short as well as long fibers without some damage, we have found it desirable to limit the degree of milling to obtain the maximum practical strength. Accordingly you will find in our self-set 85 percent magnesia evidences of comparatively unopened fibers. We believe this provides a better bond and higher flexural strength or ductility in the finished product.

The Process

Primary raw materials are derived from native Pennsylvania sources. There are many extensive deposits of dolomite rock throughout the state. Coke prepared at near-by coal deposits is used to calcine the dolomite in a vertical kiln.

Calcined dolomite is directly fed from the kiln by means of a circular conveyor to a crusher and storage bin. A measured flow is directed together with a stream of preheated water to the lime slaker. From the slaker the milky suspension flows through a bowl classifier where the grit and unreactive material is separated and removed from the suspension.

Hydrated dolomite or the hydroxide of calcium and magnesium then flows to the Dorr thickener, from which the concentrated slurry is pumped to the saturating towers.

Kiln gas is scrubbed, washed, cooled, and then pumped into the lower section of the saturator. In this way we achieve a counter-current flow with the liquid suspension flowing down from the upper levels of the tower and the kiln gas flowing to the top. Through controlled precipitation we have developed a method of continuous carbonation and formation of magnesium bicarbonate solution, which is later decomposed to the normal carbonate.

Slurry from the saturators is concentrated in the second Dorr thickener and then pumped directly to a re-saturator in order to remove the remaining magnesium compounds in the dolomite rock. Carbon dioxide gas obtained from the decomposition of the bicarbonate solution is used to extract the small amount of magnesium still remaining in the original ore.

In the new process, magnesium bicarbonate solutions are decomposed in a specially designed vacuum precipitator to produce desired crystals of normal carbonate. The temperature is controlled at approx. 118 deg. F. The crystals will vary from 2 to 5 microns in thickness and from 10 to 40 microns in length. These needle-like crystals of normal carbonate are essential for the preparation of a product that will hydraulically set and produce a light, yet strongly-bonded insulating material.

This method represents the first major departure from the original process. The filter-molded material is still being produced at Plymouth Meeting by the Pattison process to meet the heavy defense demands for insulating materials. The decomposition of the bicarbonate in this process is accomplished by boiling at atmospheric pressure (using high pressure direct steam) to precipitate the basic carbonate.

Normal carbonate crystals are filtered by means of a continuous vacuum filter and stored in another Dorr thickener prior to use in the new self-setting molding plant. Here we combine the crystalline carbonate with well-opened asbestos fiber. We use a blend of long South African amosite and a long Canadian chrysotile fiber.

MOLDING

Following the blend of the normal carbonate crystal and the asbestos fiber, the slurry is filtered and repulped in preparation for molding. Sufficient water is added to provide a slurry of the desired density. In this new process it is possible to control the density to plus or minus 0.5 lb. per cu. ft. We add a small quantity of magnesium oxide to absorb the carbon dioxide liberated during the setting action.

Thoroughly mixed slurry is stored in large rotating mixers comparable to an oversize cement mixer. From the slurry mixer the blended and adjusted composition of magnesia and fiber is dropped into a scale hopper. This hopper consists primarily of a conical tank and a traveling scale so that a measured quantity of mix can be poured into any one of a series of conical preheaters.

Function of the preheater is to raise the temperature of the mix from room temperature to 110 to 130 deg. F. depending upon the molding conditions of the slurry. From the preheater the slurry is fed directly into a gang mold.

A gang mold consists basically of the forms or shapes for the desired pipe covering or block. For pipe covering we have an outside wall cylinder and the inner core cylinder. In the annular ring we have a piston connected to a hydraulic ram. Hot water is circulated both in the core as well as around the outside surface of the mold. Normal bath temperatures are in the range of 180 to 195 deg. F.

The mold is equipped with a filling hopper so that the slurry can be poured from the preheater into the filling hopper and then into the molds themselves. To aid in the filling as well as to orient the fibers in a longitudinal direction and remove the occluded air, we have provided a set of oscillating fingers.

The entire mold cycle is controlled by means of an automatic timer. For example, let us follow through a single molding cycle. Assume for a moment that the mold is empty and that the hydraulic pistons are in the upper position, flush with the top of the mold. The operator will press a dump button and drop the preheated slurry into the filling hopper. The operator will then start the descension of the pistons which in turn will start the oscillation of the fingers so that the fingers will descend at the same rate as the pistons within the confines of the molds.

Preheated slurry will of course follow and fill the annular ring formed by the descending piston. When the piston reaches the bottom of the mold it automatically stops. The oscillating fingers then automatically reverse their direction and continue their oscillations until the fingers rise out of the molds. Then the entire filling hopper is raised so that the mold surface is free for the ejection of the set material.

Normal carbonate slurry sets quiescently under the influence of the circulating heat in the mold box. Some carbon dioxide gas and water are liberated during the setting operation. Normal setting time will vary, depending upon thickness and temperature of the preheated slurry.

Set material when ejected from the mold has sufficient rigidity and strength to be self supporting even though it contains about 85 percent water. The removal of this tremendous quantity of water with practically no shrinkage (0.25 percent) gives its remarkable insulation properties.

Then the set material is placed on cars and put through drying kilns. The only finishing operations required are the end trimming of both blocks and pipe covering and the splitting in half of all the pipe covering sections. In the filter-molded process, it is necessary to machine or mill the surface to provide proper dimensions and accurate fit on the pipe to be insulated.

As a final step, a canvas jacket is applied to the outer halves of the pipe covering which, in turn, are dried and packed directly into cartons.

Physical Characteristics of Precision Self-Set Magnesia Insulation

Density	Approximately 10 to 11 lbs. per cu. ft.
Flexural Strength	40–80 lbs. per sq. in. modulus
Compressive Strength (at 5% deformation)	60–65 lbs. per sq. in.
Impact Strength	15 ft. lbs —blocks 6" wide x 1¼" thick
Shrinkage	0.5% at 800° F.
Conductivity (k)	
At 100° F.	.345—.381
300° F.	.425—.456
500° F.	.491—.504
Moisture Absorption (Volume)	After 6 hr. exposure in atmosphere of 120° F. and 90% relative humidity . . 0.9%

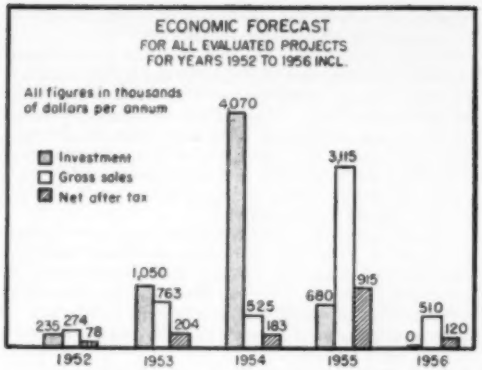


Fig. 1—Over-all economics of the research division's program. This chart gets close scrutiny by management.

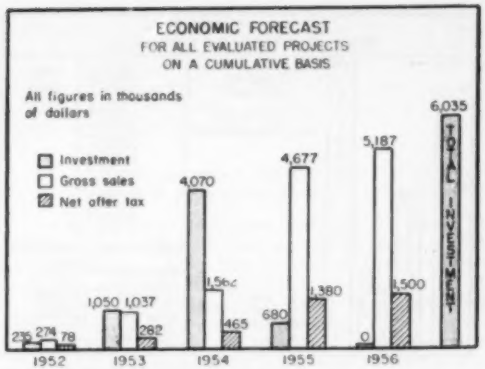


Fig. 2—Cumulative effect of current research projects on the future fortunes of the hypothetical corporation.

How to Make Research Pay

No matter how large or small your annual research budget is, you want to get the most for your money. Here's how Wyandotte does it. The chemical engineer's preliminary estimates play a leading role.

THOMAS H. VAUGHN

This article is based on a paper presented at the Fourth Annual Conference on the Administration of Research, sponsored by the Engineering Research Institute of the University of Michigan.* Prepared in the form of an interview, Dr. Vaughn answers questions posed by the Editor.

Most research organizations, because of limitations in money and manpower, can carry to completion only a small fraction of the research projects suggested for study. How do you decide which projects to push and which ones to table or drop?

There are many criteria by which you can judge the suitability of a project. On one extreme lie the technical considerations as to the possibility of completing the research satisfactorily. On the other end of the scale are the very broad business questions having to do with the future health of the child of research, should it pass through adolescence and reach maturity.

Such general business questions should be of great concern to the men who plan and conduct research. A few simple questions of this type are: Will the project lead to a product which is in our field of business? Do we have competent manpower and equipment to do the job? Do we have a good raw material situation? How much investment will it require? What kind of a return can we expect on that investment? Will the product create new markets, or will it enter into a market which is currently of sufficient stability and expansiveness to absorb the new material?

The answer to these and many other similar questions add up to a composite answer to the question: Is it good for the health of your organization?

What do you mean by the "health" of an organization?

Just as your physician compares your blood pressure, pulse rate, reflexes, and weight against those known from experience to be normal for healthy individuals, so can an industrial organization be considered healthy if it measures up to certain standards. Quantitatively, these standards are best told by the financial status of the company.

The financial facts of life of chemical and allied companies have been analyzed by Aries and Spence[1] and Pescatello.[2] Their data are summarized in Table I. It will be noted that for the year 1949 net return, after taxes, amounted to 8-8.5 percent on gross sales and 10 percent on investment. Turnover (ratio of sales to investment) for 1949 was 1.15-1.4.

This financial information provides a general background against which research projects in the chemical and allied industries may be evaluated in terms of their possible worth to an organization, should they prove to be technically successful. Of course, similar information can be obtained for any selected company or group of companies by consulting their annual statements or by using

TABLE I

	Year	Profit on sales	Return on invest.	Turnover ratio
Aries and Spence[1] (100 companies)	1939	9%	7%	0.84
	1949	8%	10%	1.4
Pescatello[2] (25 companies)	1949	8.5%	10%	1.15

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* Proceedings of the conference have recently been published in full. Copies may be obtained by addressing the University of Michigan Press, 311 Maynard St., Ann Arbor, Mich.

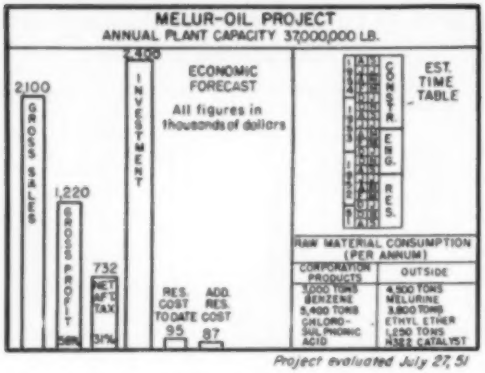

Fig. 3—Economic forecast for a hypothetical research project. Similar charts are used for other major projects.

information available from Standard and Poors, Dun and Bradstreet, and other financial reporting houses.

Just how do you use financial data to evaluate the desirability of a research project?

For the purpose of this discussion, let us set up a hypothetical corporation which has $100 million invested in its business and which at present has a net sales volume of $110 million a year. Currently, this company is enjoying a net return after taxes of $8 million a year.

This company is considerably behind the parade in several respects: The ratio of sales to capital invested is lower than it should be, this ratio being only 1.1. The net return on investment is only 8 percent, as compared to a 10 percent average for the industry, and the profit based on sales is only 7.3 percent against an industry average of 8-8.5 percent.

Obviously, then, this company has a real need for a research program which is aimed at projects yielding an unusually high return. It would probably be willing to put a large proportion of its research funds into such projects, even though some of them may have considerable risk attached as compared to short-term, sure-pay off jobs which would not materially improve the relative position of the company.

Let us look at a hypothetical project which our research and development division has under way. One project on which it has been engaged for some time and on which it has spent $95,000 to date is the Melur-oil project, involving the synthesis of melurine-1,5-disulfonic acid and its application as an oil-treating agent for automotive use. This project looked good when an economic forecast was made on it approximately two years ago, and our latest forecast, which was made on July 27, 1951, still looks exceedingly promising.

It will be noted in Fig. 3 that this project, which calls for a capital investment of approximately $2,400,000, will show a gross sales of $2,100,000. This does not quite meet the needs of our hypothetical corporation, because the ratio is still adverse. On the other hand, this project shows a good gross profit and a net return after taxes of approximately 31 percent, and will require the investment of less future research money to bring it to fruition than has previously been spent. In other words, the investment of the corporation is increased by about 2.4 percent to add approximately 2 percent to its annual sales volume, while increasing its profit by almost 10 percent. This naturally appeals not only to the research director but also to the other executive officers of the company.

Equally important is the fact that the project would consume products now produced by our hypothetical corporation, namely, 3,000 tons of benzene and 5,400 tons of chlorsulfonic acid. It would also involve the purchase on the outside of other raw materials as indicated in Fig. 3, which, it happens, are extremely easy in supply at this time and which will be available in suitable quality and quantity for several years to come, according to our purchasing and market research departments.

Consequently, our research director looks at this project in its present status and, after discussing it with other divisions of the corporation, approves the expenditure of the estimated additional $87,000. He does this because he believes that any project that will yield better than 25 percent after taxes is a good one, provided all the other factors seem favorable.

How do you transmit the results of such evaluations to management?

The supervisor in charge of the project addresses a memorandum to his director of research, in which he covers the basic objectives of the program, gives the background information, and provides a research forecast. This forecast states the amount of money which has been spent to date, estimates how much money will be needed to conclude the research phase of the project, estimates the date on which the project can be terminated, and outlines the probability of technical success. He furnishes a production forecast, which indicates the probable investment which would be required to put the findings of the research group into effect, assuming of course that they are positive and turn out as he expects. He also provides information of an economic nature, indicating the savings or earnings which would result if the contemplated investment were made.

This information is reviewed by the director of research, who makes whatever changes, deletions, or additions are necessary. It is finally turned over to a draftsman for the preparation of a chart like that of Fig. 3. Similar charts are prepared for all major projects under way.

Other charts are used to illustrate the over-all economics of the research division's program, such as Figs. 1 and 2. Here we find the picture, year to year, of what we may have to invest, what we may realize in the way of added gross sales, and what the net after taxes may be. This type of information is particularly helpful to other executives in the company, since it shows them where their research program is headed.

The people primarily concerned with the financial fortunes of the corporation are put on guard, because the program which the research division has under way will require the investment of certain sums of capital. They may then decide either that this capital requirement is exorbitant or that it can be readily met. This decision will naturally have an effect upon the research program.

Similarly, the added sales which will result from year to year are of interest to the sales executive. He knows whether he needs to be training or hiring new salesmen, and when; he knows, from a consideration of the individual projects, what kind of salesmen they should be, and thus he is given advance notice as to exactly what may be expected of him in the future. The material is of equally great importance to the production department and other groups.

Another use of the information shown in these charts is to prepare a forecast of the demand on the corporation's present products to determine whether or not the present capacity of the corporation is adequate to meet the

demands which the research division is trying to set up by the expenditure of the corporation's funds.

In the case we considered, we have no trouble, because the amount of product required as raw materials for the production of Meiur-oil is less than the unsold capacity of the company. It does, however, give the executive in charge of sales some reason for concern. He is definitely put on notice that as early as 1953 this corporation may demand from its present production capacity certain amounts of benzene and chlorsulfonic acid, and that these amounts represent a large share of the present unsold capacity of the company. He therefore should be somewhat reluctant to enter into long-term contracts to sell a greater volume of these materials or, alternately, he should insist that if he decides to enter into such contracts, the production department be prepared to expand their capacity by 1953.

How early in the game, and how often, should a research project be subjected to economic analysis?

In some cases, the first analysis can be made on the basis of a paper study, before any experimental work is undertaken. Usually, however, a few scouting tests are necessary in order to provide the minimum fundamental information.

Throughout the project, a fresh economic analysis should be made whenever significant progress (or failure) has been achieved in the laboratory or whenever external conditions have been altered. Discovery of a new use which will broaden the market, for example, will affect the economic evaluation.

How much time and money should be spent in exploring new ideas before the evaluation watchdogs are called in?

In our own organization, and I think this is true in many others, each man has some opportunity to explore ideas that he believes may have some ultimate benefit to our business. We do not sponsor deliberately and formally any so-called fundamental research work which has no possible application in our business, but we do some of that kind of research in the early periods of some projects. The men in the laboratory should be able to spend some time, if they so desire, on a project without it being officially on the program.

Some companies have adopted a percentage basis for the allocation of time to such work. I know one organization which permits its research men to put in 20 percent of their time on anything they like, and there is no restriction whatsoever on what they do with that time.

What about safety factors in the preliminary engineering estimates? If the engineers are too pessimistic, won't some projects die a-borning?

That is one of the toughest problems we face. Our estimates are normally based upon partial layout of a plant by an engineer who has had a lot of experience in "guesstimating," and we use his figures just as though we believed they were correct. The engineer shouldn't try to shade his figures either high or low, but whenever he foresees trouble, he should take it into consideration and take the most expensive way out. For example, if the question of using steel vs. stainless steel comes up, he should figure on stainless, thus putting in a possible cushion.

I have seen plants that have been engineered, appropriated, and built which have cost 30, 40, and even 50 percent more than they were supposed to. If this happens on a project that shows 25 to 30 percent return on investment, it doesn't cripple you too much, but if it happens on one that shows only 12 percent, you may be in serious trouble.

So we have tried to keep our engineers from altering their guesses one way or another. We would rather get them exactly as they see them. If they see them right, that is good, but if they see them wrong and pad them too, things may be much worse.

Should preliminary estimates allow for possible increases in construction costs due to inflationary effects?

There is some self-compensation involved here. That is, the sales dollar also increases with inflation, as a general thing, so that the ratio between sales and investment remains somewhat constant.

We don't worry too much about figures being valid three or four years from now, because we are spending money trying to refine the figures and find out what they actually are. The figures we like to have confidence in are those for this year and next.

On the hypothetical project described earlier, an engineer has had to design and estimate a plant, even though the research is far from complete. He is working with very little information, and you can't hold him too closely to his estimate. The uncertainty of his capital investment figure is much greater than any effect inflation might have on the value of the plant.

Do these economic evaluations eliminate the need for exercise of judgment?

No. You must realize that most of the figures you use are not factual—they are guesses, and the area of certainty represented by each guess is open to question. You must also allow the judgment of others on some points to influence your own thinking, even when you are relatively sure that the judgment being expressed is incorrect. After all, the modern industrial organization moves as a team, and teamwork needs the subordination of individual thinking and judgment to that of the group as a whole.

For example, suppose that a large sum has been spent for research on a new project. Its probability of technical success is high, but the latest economic study shows a return of only 12 percent. However, the controller, sales manager, production department, engineering department, and all others who have contact with the project are highly enthusiastic about it. It would therefore seem to be an ideal project to push, even though the return on investment is considerably lower than that which you would normally consider as good.

On the other hand, if you have a project which shows a 42 percent return on investment, but production and sales are strongly against it, you should turn it down as a poor risk. It is a poor risk because the bases of their judgments are probably better than yours. Moreover, even if your facts were right and theirs were wrong, you would not have the kind of support from the organization as a whole that would be necessary to put the project over.

Does the bench chemist resent having the dollar sign hanging, like the sword of Damocles, over his pet project?

As a rule, no. We find that the man at the bench soon begins to think in terms of ultimate economics, and I know of no healthier situation in an organization whose primary aim is the commercialization of research.

REFERENCES

1. Aries, R. S., and Spence, J. W., *Ind. Eng. Chem.*, **42**, 936 (1950).
2. Pescatello, M., *Chem. Ind.*, **66**, 670 (1950).

Qualities That Make for Success

Advice—for the graduate—that any engineer can profit from. The ability, the motivation, the underlying philosophy and the personal qualities that put a man up on top—and keep him there.

J. R. CUTHBERT

Today, the young engineering graduate can pick the field that holds the greatest interest for him, for opportunities are everywhere.

Where the graduate starts in industry seems to be relatively unimportant, provided he is interested in the work, in doing the job to the best of his abilities, and provided that the opportunity for advancement is present in the company.

Assuming these provisions, there are certain characteristics an individual must possess or develop. These fall into four main headings: ability; desire; economic, moral and social philosophy; and human relations. There are probably others, but these are essential.

Ability, Sine Qua Non

Let's consider ability. We can assume that the budding engineer has demonstrated his ability to absorb and apply sound technical training by the time he is graduated from his engineering school.

In industry he must develop the ability to analyze facts and to reach a sound conclusion. In many cases after he has assembled and analyzed all the facts, he will still find obstacles in the way of reaching a conclusion—obstacles which cannot be overcome by the application of technical principles alone. He will find many times that what is called for is what we in industry term a "bold guess." He should develop his ability to plug the gaps left by the application of technical principles to the available data. And, when he has plugged the gaps, he must have the courage of his convictions. He must not be afraid of making a mistake. He must be willing and able to make a decision and to accept the consequences.

Call it the application of sound judgment. Call it intuition, hunch or what you will—the cold fact is that sooner or later the man who can honestly say "I recommend *this*" will be worth ten men who say: "Here are twelve solutions—take your pick."

About this "bold guess." I want to emphasize that guesswork is never a substitute for sound thinking. Above all, the young engineer must be intellectually honest—guesses and estimates are to fill gaps—not to substitute for facts. Getting and analyzing the facts may sometimes seem to be sheer drudgery, but if he is not honest with himself, he will be of little value to anyone else.

J. R. CUTHBERT is the manager of the No. 1 refinery of the Standard Oil Co. of Ohio. These views of a seasoned chemical engineer and industrial executive should be of interest to the young who need advice and to the experienced who need to advise.

Another item under the heading of ability is one in which many an engineer is found lacking. This is the ability to express himself—to sell his ideas to others. No matter how well-reasoned is his recommendation it will accomplish nothing if it is not accepted by other people.

This characteristic is really very simple. It involves the ability to communicate—to speak and to write. If his ideas are not accepted as often as he'd like, he should not become discouraged. Look at it this way. "What was wrong?" "How should I have presented it?" He should analyze his own shortcomings and next time do a better job. Nine times out of ten the man who says "I know what I want to say, but I can't put it into words" doesn't really know what he wants to say at all.

Desire: To Will Is To Do

The second main category of characteristics mentioned earlier was DESIRE. Perhaps it seems that this could all be summed up by saying simply that the man who doesn't want to be a success certainly won't be one. But it is a little more complicated than that. He must sincerely want to do the kind of work he is doing. He must obtain from his work the personal satisfaction that is necessary to a well-adjusted life. He must be sufficiently interested in his work so that he is willing to make the personal sacrifices that will be necessary if he is to carry on his job.

Outlook: As A Man Thinketh . . .

The third heading was Economic, Moral and Social Philosophy—the individual's philosophy toward life. This is not just propaganda about Free Enterprise—the American way of life. Statistics show that most college graduates are woefully ignorant of the economic facts of life, and are even more ignorant of the part that industry plays in our American society. Our economic system is the key to our American way of life. Our American industries are the result of this society and they are as much a part of our American system as our religion, our homes and our schools.

Humans: Do Unto Others . . .

The heading Human Relations was left until last but it is certainly at least as essential as any of the other three. Historically, qualification in the human relations aspects of the job has been a serious weakness in young engineers. Here we are talking about people, not facts or statistics.

If the young engineer does not like people—if he does not want to work

(Continued on page 148)

Rating Systems That Find the Successful

One of the most difficult of management jobs is finding, rewarding, and thereby keeping, the best men. Here is a brief look at merit rating—a difficult art becoming more and more a science.

RICHARD V. REEVES

There is an experiment that psychology professors like to try on new students. The professor holding a white egg-shaped object in his hand asks the class what it is. Invariably, his class replies "an egg"—almost to a man. Thereupon the professor throws the "egg" to a man in the front row—or he drops it on the floor. Of course, it's not an egg at all, it's an egg-shaped piece of wood painted white.

Merit Rating: The Problem

This illustrates a problem that enlightened managements have been faced with for years: The formal methods of finding the best men, rewarding and encouraging them with periodic salary increases and promotions.

It would seem to be an easy job to recognize a good engineer just as it would seem easy to recognize a good egg—or smell a bad one.

It would seem easy to anyone except the man who's given the job.

This business of merit rating is something you've probably never thought about as such. Yet you've probably thought a lot about where you stand with your company. Recently the Conference Board of the Prudential Insurance Co. of America[1] asked workers in a number of companies to rank in importance 73 different factors that were presumed to be involved in worker morale. The white-collar workers chose as fifth in importance "the practice of informing you of your job status, including both successes and failures," and eighth in importance was "employee merit and performance rating."

Only "job security," "type of work," "compensation," and "opportunities for advancement" ranked higher than the practice of informing you where you stand on the job.

There seems to be no reason why we cannot project the results of this sampling to most chemical companies and get an idea of the importance of merit rating.

The Importance

A good system of merit rating is important to a company because it is the means whereby management finds the best men and by suitably rewarding them for superior performance, keeps them on the payroll. Without such a system, favoritism can ruin a company, indifference can degenerate it.

So it works both ways. For the man on the job, it tells him exactly what's expected of him and he knows with reasonable certainty how top-notch work will be rewarded prestige and salary-wise.

He also knows that he will be given suggestions for improving the areas he may be weak in. For instance, some of the best engineers have no idea why their company is in business. They may think that "profit" is a word for company presidents to make speeches with. An early diagnosis and prescription for this engineer can save an alert company both money and talent. Money that the engineer was wasting and talent that he could take to a rival company.

Other good engineers are weak in human relations. This condition, too, can be ameliorated as can most weak points. It isn't difficult with people of the high degree of intelligence possessed by engineers.

Not many companies subscribe to

JOB PERFORMANCE REPORT

Job Title | (Reserve this space)

Employee's Full Name

Section | Division | Department

Rater | Position of Rater

A. TECHNICAL ABILITY: KNOWLEDGE, SKILL EXPERIENCE

1. Describe the employee's performance of his required duties.

2. Cite specific examples of satisfactory or unsatisfactory performance.

D. PERSONNEL RELATIONS

12. Describe the employee's job behavior in relation to his superiors, associates and subordinates.

13. Cite specific examples of satisfactory and unsatisfactory conduct.

the practice of discussing the results of merit rating with their employees. But those that do are enthusiastic. They are enthusiastic about merit rating in general because they have a successful system.

The Shortcomings

But too few companies do have a successful system. It's not hard to see why. The mechanics of having one man rate another seem simple. Actually the process is so complex that it puts the giant electronic "brains" to shame. Observations, facts, impressions, become grossly distorted or "conditioned" after they travel through the billions of neurons that make up a human nervous system.

Law enforcement officers are especially aware of this fact when they have to depend on second or third hand accounts of an accident or crime. A red-haired man wearing glasses and a glen-plaid suit may become a dark, swarthy individual in a dark suit to an eye-witness.

So most merit rating systems instead of being an index of facts become bogged down with personalities. Though they have been with us for the last two decades, like all of the wares of the psychologist, they are more of an art than a science. The technique is no more successful than its administration or administrators or both.

What does that mean? Well let's consider the average supervisor asked to evaluate one of his men. He may be likened to a man with his right hand in a bucket of hot water, his left in cold water. If he immediately plunges both hands into a pail of water at room temperature, how does it feel to him? To his right hand, the water is cool, to his left, it is warm. The water hasn't changed. But the man testing the water has been "conditioned." So it is with the supervisor rating a subordinate. If he's a Yale man rating another Yale man, he's probably conditioned one way; if he's rating a man whose errors have cost him a promotion, he's probably conditioned the other way. This is where merit rating most falls down.

The "halo effect" personnel directors speak of is a form of this "conditioned" evaluation. It is simply the tendency to overrate a man in all respects because he rates well in one quality.

The Promise

This makes most merit rating systems look pretty unsatisfactory—and they are. Luckily though, a very promising method has come out of World War II.

Very briefly, the crux of this method is as follows[2]: A list of "critical requirements" for a particular job is drawn up. For instance, a research executive needs such qualifications as the ability to identify and explore problems; to set up hypotheses; to develop systematic and inclusive plans; to prepare good reports; to coordinate the work of groups etc. etc. Perhaps fifty or a hundred such crucial requirements are set down on the merit rating form. These requirements are crucial in the sense that they have been observed frequently to make the difference between success or failure in a certain job.

The technique appears to be the most promising to date in that it is designed to substitute facts for the vague hunches and the poorly defined traits like character, imagination, appearance, foresight, etc.

The technique is still in its infancy. The job of screening hundreds or thousands of job requirements down to a list of fifty or a hundred "critical requirements" is enormous, but it is worth the effort. It is the first step in developing a merit rating procedure that will work, not for 10 percent of the companies using it, but for 90 percent of them.

REFERENCES

[1] Bittner, Reign, "Developing An Employee Merit Rating Procedure," Rating Employee and Supervisory Performance, American Management Assn., New York, 1950.

[2] Flanagan, John, "What Is Needed In A Research Executive," Proceedings of the Fourth Annual Conference on the Administration of Research, University of Michigan Press, Ann Arbor, 1950.

QUALITIES FOR SUCCESS

(*Continued from* page 146)

at getting along with people, and understanding them, his course will prove very difficult.

Modern American industry is largely a matter of cooperation. The individual's future depends upon the work of others as well as upon himself and his success will hinge to a great degree on his ability to get along with others.

The principle that will guide him to success in the human relations aspects of his work sounds so simple that it seems hardly worth saying: "You must never forget that people are human beings." As such, they are as often guided by their emotions as by reasons or logic. Too many engineers cannot understand this, or they cannot take time to learn it when busy with the more concrete factors affecting their work. The young engineer must constantly remember that his every action in business will in some small way affect another person. He must realize that the other person may not think the same way he does, that his reasoning process may be entirely different, that he may be more or less governed by emotions.

The young engineer should hesitate to write off the human obstacles that he will encounter on the theory that the other person is "unreasonable." There are really very few unreasonable people. Usually all that is wrong with the unreasonable man is that you do not understand him. The problem is to try to understand how he thinks about the situation. That is not too tough a job, and it can make a man's work easier and it can make his life much more enjoyable.

It is not necessary that we all become amateur psychoanalysts. Think of it this way: We all have friends, many of whom have no connection whatever with our chosen field of work. We didn't make these friends by treating them as statistics or inanimate objects—or machines. We made them by acting toward them as a normal human being. Everyone has the ability to make friends. The engineer can and should carry that ability with him when he goes to work. He should not leave it at home with his family, or with his bowling team.

The young engineer will find that he'll never stop learning from the people he works with—the laborer, the craftsman, the man who actually does the work on the projects can always teach the young engineer something if he is willing to learn. There's a practical "know-how" available from the worker that the technical man can gain in no other way than by first gaining the confidence and the respect of the worker. This theory applies equally to those below you, above you, and on the same level with you in the organization.

There is no short course one can take before he goes to work that will teach him all of these things. He will just have to learn through experience. His first years on the job will be spent almost exclusively in learning.

These thoughts are not offered as a formula to success. There is no such formula. The young engineer should get firmly established in mind one solid fact: modern business management does not hire technical men without expecting to promote them.

What Does Maintenance Cost?

HERE ARE ACTUAL COST DATA TO HELP YOU:

1. Prepare estimates of maintenance cost for new plants.

2. Sharpen up cost-reduction programs on your old plants.

JACKSON D. LEONARD

One of the most perplexing problems facing the chemical engineer is the accurate estimation of maintenance costs. When preparing manufacturing cost estimates for new products, or even for an existing product using a changed or modified process, maintenance cost is the most difficult factor to predict.

At first glance, estimation of maintenance costs appears to be quite simple. All you do is assume that annual maintenance costs will amount to a certain percentage of your plant investment. The problem then becomes one of deciding what percentage to use. But this percentage factor might be as low as 1 percent or as high as 15-20 percent.

Suppose, too, that you add plant investment in the way of corrosion-resistant alloys, mechanical shaft seals, extra manholes and handholes, etc., in order to reduce the cost of repairs and replacements. This added investment will reduce maintenance costs. But if you are estimating maintenance costs as a percentage factor on investment, you are obviously working in the wrong direction.

In developing a more direct approach to the problem, we run into a number of difficulties. The corrosion factor alone is a serious obstacle, not to mention the variety of other service conditions. Add, too, the effects of mistakes and shortcomings in design and construction.

Management's attitude has a great effect upon maintenance costs. In some organizations, management demands that no money be spent until an actual breakdown occurs, while at the opposite extreme, some plant managers charge the maintenance organization with the responsibility of maintaining the complete plant, buildings, and equipment in as nearly perfect condition as it is humanly possible to achieve.

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However, if we make some simplifying assumptions, the boundaries of the problem can be defined so that some reasonable figures for maintenance costs can be obtained. These assumptions are:

1. Equipment has been selected with enough knowledge to insure that it can successfully withstand the service conditions while performing its intended functions.

2. Equipment will be fabricated of material possessing adequate resistance to corrosion.

3. Designer, process engineer, and construction crew did a reasonably good job of designing, sizing, and installing the equipment.

4. All necessary measures will be taken to insure good condition of the equipment at all times.

On this basis, we have attempted to determine maintenance costs for each type of well known commonly used process equipment. Wherever possible, costs are given on a chemical engineering basis, such as $ per sq. ft. of filtering area or $ per ton ground.

FILTERS

Costs given include cloth, plates, grids, drives, and any other material needed to maintain the unit as a filter.

Rotary Vacuum Filters—On an area basis, this type seems to be one of the most expensive pieces of filtration equipment to maintain. Annual costs range from $9 per sq. ft. of filtration surface for rubber and alloy types to $11.50 per sq. ft. in wooden construction.

Pressure Filters—Maintenance costs average from $1.60 per sq. ft. in the larger sizes to $3 per sq. ft. in the smaller sizes.

Intermittent Vacuum Filters—The Moore and Butters filters are still fairly widely used and seem to fall next to the rotary filters in cost, ranging from $2 per sq. ft. in rubber and alloy units to $4.25 per sq. ft. in wooden units.

Plate-and-Frame Filter Presses—These represent the lowest maintenance cost of the filter group. Costs range from $0.85 per sq. ft. in the rubber and alloy class to $1.10 per sq. ft. in wooden units.

CRUSHERS AND GRINDERS

Jaw and Gyratory Crushers—Used principally for preliminary size reduction, maintenance seems to be chiefly for the drive. Costs range from $70 per yr. for the smaller sizes to $400 per yr. in the larger sizes. On a tonnage basis on a material such as cake alum, cost will run less than $0.02 per ton of material crushed.

Pan and Roller Mills—Used for final size reduction of a wide variety of chemical raw materials and products, these mills are expensive to maintain. Grinding rings, rolls, shafts, bearings, and drive mechanism all need frequent service. Costs range from $2,000 per yr. for the smaller sizes to $7,000 per yr. for the larger sizes. On a tonnage basis, grinding material such as titanium dioxide, costs will range from $0.60 to $0.71 per ton handled.

Ball and Tube Mills—Mills of this type are generally used for full size reduction of very hard or abrasive materials. A classification system is usually tied in directly with the mill. Maintenance costs are chiefly for balls and tubes used to accomplish the grinding, while drive repairs and lining replacement inside the mill constitute the remainder. However, maintenance costs on certain types of classification systems are also appreciable, especially the rotating blade type used in air-cyclone systems. Maintenance costs exclusive of classifying systems average from $0.08 to $0.12 per ton ground.

Mikropulverizers—This grinder has won wide acceptance in the chemical world. Case liners and screens constitute the chief maintenance cost, but occasional feed screw and drive belt replacements must be made. Maintenance costs are fairly low, ranging from $0.04 to $0.07 per ton ground.

Other Impact Mills—There is quite a variety of impact mills in service. Maintenance costs generally range from $0.10 to $0.18 per ton ground.

PUMPS

Centrifugal Pumps—These pumps, made in a variety of materials, are

widely used in chemical plants. The chief cost is the maintenance of pump packing. In recent years, mechanical seals have been greatly improved and are tending to replace the conventional stuffing box, with greatly reduced packing costs. The costs given in Table I represent average costs by sizes. They assume the pump is built of proper material for its service. Note how increased head requirements affect maintenance costs.

Diaphragm Pumps—In certain services, this type positive displacement pump is necessary. Its construction permits handling very thick, abrasive, or corrosive slurries and liquids, and still develop high heads. Maintenance costs, however, are correspondingly high (see Table I).

Piston Pumps—Certain services, such as the handling of heavy slurries, feeding of liquids into equipment under high pressure, and handling of viscous liquids, almost necessitate the use of piston pumps. Costs vary considerably depending on the service, but many will fall in the ranges given in Table I.

Gear Pumps—These are not as widely used as the other types of pumps, but have found usage for handling oils and other heavy, usually non-corrosive, liquids where high heads are required and the agitating action of an impeller is undesirable. Maintenance costs are fairly low, ranging from $50-60 per yr. in the smaller sizes to $125-150 per yr. in the 40 to 50 gpm. sizes.

Table I—Maintenance Costs for Pumps

Gal. per Min.	Head, Ft.	Maintenance Cost, $/Yr.
Centrifugal		
30	50	$75–90
30	100	150–175
100	50	100–125
100	100	200–225
200	100	225–250
Diaphragm		
Up to 20		400–425
20–40		400–600
40–80		500–800
Piston		
Up to 20		125–150
20–40		150–175
40–90		200–250

TANKS

Tanks are to the chemical industry what machine tools are to the metal industries. Attempting to set maintenance costs for the wide variety involved is rather difficult. However, classifying them by service does permit some average costs to be developed.

Weak Acid up to 50 deg. C.—Wood stave tanks are the cheapest to buy and the lowest in maintenance for this service. Maintenance usually consists of painting and tightening the hoops once or twice a year, and service lives of 10, 15, and 20 years are not uncommon. Annual maintenance costs range from $15 per 1,000 gal. of capacity in the smaller sizes to $10 per 1,000 gal. in the larger sizes.

Rubber-lined steel is also used for certain types of service in this range and is very satisfactory. Maintenance costs range from $40 per 1,000 gal. in the larger sizes to $30 per 1,000 gal. capacity in the smaller sizes. Various types of resin linings have enjoyed a fair amount of success in this class and, if properly handled, have maintenance costs ranging from $40 to $50 per 1,000 gal. per yr. Stainless steel tanks are also employed for acid service where the alloy has been tested and found suitable and cheaper material cannot be used. Maintenance costs on stainless tanks are low and range from $5 to $10 per 1,000 gal. per yr.

Weak Acid From 50 deg. C. to Boiling—This service usually requires either lead-lined steel, or brick-lined on top of lead-lined steel. Of the two, the latter is by far the cheaper to maintain. This type ranges from $25 to $40 per 1,000 gal. per yr. Lead-lined steel tanks range from $200 to $250 per 1,000 gal. per yr. Haveg tanks have made a good reputation in this class and maintenance cost is low if they are properly handled. Costs range from $5 to $10 per 1,000 gal. per yr.

Neutral or Alkaline Solutions—Wood stave or steel tanks are most commonly used for this service. Maintenance costs are very moderate, ranging from $10 to $15 per 1,000 gal. per yr.

Drug or Fine Chemical Services—Glass-lined vessels are commonly used in this service. However, in addition to being high in initial cost, they are also costly to maintain, as the price of replacing the glass lining is ¼ to ½ the initial cost of the vessel. Unless great care is taken, linings may last only 2 or 3 years in agitated vessels. On this basis, maintenance costs may be as high as $1,000 per 1,000 gal. for agitated vessels and $800 per 1,000 gal. per yr. for storage vessels.

Various plastic linings have been developed to compete with glass; they have been successful chiefly as storage vessels. Maintenance costs average only $50 to $60 per 1,000 gal. per yr., if properly selected and used.

Special Tanks—For special services, concrete, stainless steel, aluminum, and other special materials have been used. Usually tanks in this class are fairly expensive, and materials of construction are carefully investigated in advance to insure long service and low maintenance. The cost for tanks in this class covers simple external maintenance, such as painting, cleaning, and inspection, and runs about $3 to $6 per 1,000 gal. per yr.

CENTRIFUGALS

Continuous Horizontal Centrifugals—This machine has found application in many processes for the separation of solids from liquids, or the classification of various solutions or slurries. It is well suited for large tonnage applications.

However, maintenance costs are fairly high, as most applications require a semi-annual overhaul to replace worn plow tips and slingers. Screen type bowls must be replaced once every 3-4 months, and the solid bowls, every few years. Drive belts and torque control systems also need fairly regular repairs or replacement. Thus costs range from $500 per yr. for the small 24-in. machines to $3,000 per yr. for the large 54-in. machines.

Suspended Basket Centrifugals—This type has found wide usage and acceptance in the chemical industry for a variety of products and services. They are built in rubber-lined, stainless, glass-lined, steel, and plastic-coated construction.

Maintenance costs are chiefly for repair of linings, brake, and drive, basket liners, and occasional basket repair or replacement. The small 26-in. sizes will average around $250 per yr. while the large 60-in. units will run $400-$500 per yr.

Underdriven Centrifugals—Used in many of the same applications as the suspended basket type, the underdriven centrifugal has the disadvantage of lower capacity because of the greater unloading time required. Materials of construction are the same, and maintenance costs run almost the same as those for the same size suspended basket machines.

DRYERS

Continuous Belt Dryers—For large tonnages of material difficult to dry, for reason of heat sensitivity, slow diffusion, or other special considerations, the continuous belt dryer is ideal. If properly designed and installed, maintenance costs will be fairly low. Occasional fan blade replacement, steam coil replacement, and minor belt repairs are about the extent of the required maintenance. Costs as low as $300 per yr. for small 8-ft. wide × 30-ft. long units and $400-$500 per yr. for larger 8-ft. wide × 70-ft. long units are customary. The feed devices used with this type dryer, such as the oscillating extruder or finned drum, usually incur more maintenance expense than the dryer itself,

depending on the product being handled.

Continuous Rotary Dryers—Dryers of this type are usually fairly cheap to maintain, as the chief costs result from roll, trunnion, and drive repairs and lubrication. Costs run from $100 to $300 per yr. for units 6 ft. dia. × 30 ft. long.

Spray Dryers—Finding much wider usage in recent years for special drying applications, the spray dryer is fairly economical to maintain. Exhaust air bags, star valves, and spray device repairs form the chief maintenance costs, which range from $150 per yr. for small units to $350 per yr. for the larger sizes.

Drum Dryers—Widely used for drying liquid solutions or slurries to solids, maintenance costs are fairly moderate. Repairs to the doctor blades and rotary steam seal and annual redressing of the drum surface form the chief items. Annual average costs range from $3 to $4 per sq. ft.

Tray Dryers—There are many variations of the tray dryer, and they are widely used for a variety of chemical products. The usual form is an insulated housing with racks for enamel, stainless steel, or wooden trays, steam coils to heat air, and a fan to circulate the air and exhaust it.

Maintenance costs on these units are fairly low, provided no special corrosion problems are involved. Occasional steam coil repair, fan lubrication and blade replacement, plus tray repairs cover the extent of the servicing required. Annual costs range from $1 to $2 per sq. ft. of drying surface. Tray dryers designed and built to employ vacuum have the advantage of greatly increased drying capacity but with maintenance costs ranging from $2 to $3 per sq. ft. per yr.

EVAPORATORS

Multiple-Effect Evaporators—These units have won wide acceptance for large scale evaporation applications, and maintenance costs, on the basis of liquid evaporated, are moderate. Repairs are chiefly for replacing steam tubes, removal of scale, and repair of condenser jets, tail pipes, transfer pumps, and salt removal apparatus. In non-corrosive services, costs can be expected in the range of $500-$600 per yr. per stage for units containing 1,000 sq. ft. of heating surface.

Batch Evaporators, Atmospheric and Vacuum—This class usually involves corrosive service and special materials of construction. Service conditions, materials of construction, and usage are so variable that cost figures range anywhere from $200 per yr. to $1,500 per yr. in 1,000-sq. ft. units.

WANTED–MORE DATA

Our reader surveys indicate that you welcome publications of this type, which give you actual cost data in usable form. The author freely admits that his data are far from complete. Here is your chance to contribute. If you can add to this catalog of maintenance costs, send in your data to the editors.

Pan Evaporators—Glass-lined dish evaporators are fairly widely used in the fine chemical and pharmaceutical fields and are subject to the same high maintenance costs as other glass-lined equipment. Relining is done usually every two years, at a cost ranging from ¼ to ⅓ the original purchase price of the vessel, equivalent to about $800 per 1,000 gal. per yr.

FURNACES AND KILNS

Continuous Rotary Kilns—Where large tonnages of such materials as cement, pigments, ores, and black ash must be handled, these kilns are widely used. Maintenance costs for brick replacement at the hot end of the kiln are usually high, as the combination of high temperature, vibration, and abrasive action of the material being handled cause fairly rapid deterioration of the lining. If wet cake is fed to the kiln, the lining at the cold end is also subject to fairly rapid deterioration due to the thermal shock of the cold feed dropping onto the hot bricks.

Maintenance costs for kilns with only the usual severe hot-end condition will average $3,500 to $4,000 per yr. for 9-ft. diameter kilns 100-150 ft. long. If the kiln also has the severe cold-end condition (wet feed), maintenance costs will run $8,000-$10,000 per yr. Outside of brick repairs, minor expenditures for drive repairs, trunnion bearing lubrication, and burner tip replacement form the only other expense.

Rotary Batch Kilns—This type furnace is subjected to the severe hot-end conditions of the continuous kiln throughout its entire length. In addition, if the feed is wet or cold, the thermal shock on the lining is very severe, and linings may have to be replaced as often as once a month. Costs will average from $4,000 to $8,000 per yr. for a 10-ft. furnace 20 ft. long.

Mannheim Furnaces—These furnaces are widely used in the production of hydrochloric acid and, if properly used and not driven beyond their rated capacities, maintenance is fairly reasonable. A Mannheim rated at 10 tons per day of 20 deg. Bé HCl should not average over $3,000 per yr. for repairs.

Nitric Acid Pan Furnaces—This type furnace is widely used for the production of nitric acid from the reaction of sodium nitrate and sulphuric acid. It consists of a Duriron pot of varying design placed in a brick setting of widely varying design and heated by an oil burner mounted under the pot. Since the operation is batchwise, thermal shock of the pot must be prevented. The brick setting, too, is subjected to fairly wide temperature changes. Maintenance costs for a unit roughly 8 x 12 ft. will average about $800 per yr.

Herreshoff Burners—Widely used in the production of sulphuric acid from pyrites, this unit is well designed for its job and is fairly reasonable to maintain. Units 18 ft. in diameter by 20 ft. high will average as little as $3,000 per yr. for maintenance.

CRYSTALLIZERS

Batch Crystallizers—These units usually consist of simple tanks with scraper agitators to keep crystals off the vessel walls and cooling drip rings or jackets on the outside. Depending on the material being crystallized, the vessel might be constructed of steel, stainless steel, stainless-clad steel, or brick-lined steel. Maintenance costs on this type of equipment (assuming the material of construction is suitable) will be chiefly for scraper blade replacement, drive repairs, and lubrication. Costs for 2,000-gal. units will average about $200 per yr.

Continuous Ribbon Conveyor Crystallizers—This type is frequently used where large tonnages must be handled and crystal size is not very important. These units are usually of steel construction and not subjected to corrosion attack. Maintenance costs are low and cover drive repairs, occasional casing patches, painting, and lubrication. One unit, or deck, 20 ft. long × 18 in. wide × 18 in. deep will average about $100 per yr.

CONVEYORS

Belt Conveyors—This type is used for hot and cold solids, ground and lump material, wet and dry cakes, and carries them uphill or down. Weekly lubrication of bearings and adjustment of rollers and guides form the major part of the attention required to keep these conveyors running day and night for many years. Cost of this servicing will average $100 per yr. for a 100-ft. section of conveyor.

Screw Conveyors—Almost as widely

used as the belt conveyor, the screw conveyor is also used to move a wide variety of materials. Abrasive materials, however, take a heavy toll, causing fairly rapid wear of the conveyor flights. In addition, wet or sticky materials frequently jam at the bearings and cause broken flights, couplings, or drives. Maintenance costs will average $200 per yr. for a 100-ft. section of conveyor.

Moving Slat Conveyors—Frequently used in the shipping or packaging end of the plant to move finished product to the shipping or storage point, these conveyors are usually run at fairly slow speeds, and when properly installed will require little more than occasional lubrication and minor adjustment. Costs will average about $150 per yr. for a 100-ft. section.

Bucket-Drag Conveyors—Buckets attached to a drag chain and scraping along a concrete or metal-lined trough are employed to move red-hot ores or concentrates discharged from kilns or furnaces. Crudely devised and of heavy construction, conveyors of this type are costly to maintain, as buckets must be frequently replaced, chain and shaft breakage are common, bearings are troublesome, and drive repairs are frequent. Costs will average as much as $600 per yr. for a 50-ft. section.

Pan Conveyors—Cast iron pans attached to chains are used to convey hot ores or concentrates from kilns and furnaces. In contrast to the bucket-drag conveyor, this type will give continuous service with little maintenance cost for years. A cost of $100 per yr. for a 100-ft. section will be representative.

Roller Conveyors—Roller conveyors are widely used for the handling of finished packages or containers, and usually are installed for relatively light services and short distances. Maintenance is almost nil, and consists chiefly of lubrication and minor adjustments. This service will cost an average of $50 per yr. for a 50-ft. length of conveyor.

DISTILLATION COLUMNS

From the maintenance standpoint, distillation columns are one of the most neglected members of the chemical equipment family. Most columns are custom built for a given service, and design considerations are chiefly for the process requirements and seldom for easy maintenance. The author has seen distillation columns erected and built in such a way that fouling of the bubble caps with carbon necessitated dismantling the entire column, section by section, just to perform a cleaning operation.

However, assuming that no such special cleaning problem exists, there are still maintenance problems arising from corrosion of the caps and risers, accumulation of scale and silt on the plates, and gradual wear of the entire assembly. Original design of the column can adequately prepare for the type of service needed. (Heaven help the maintenance man where the designer has ignored the maintenance factor!) Due to the variety of service, corrosion, and design factors involved, maintenance costs vary from $5 to $50 per cu. ft. of column space for bubble-plate columns, $3 to $10 per cu. ft. for sieve-plate columns, and $5 to $15 per cu. ft. of column space for packed columns.

HEAT EXCHANGERS

Calandrias—With most distillation columns we have calandrias providing the heat input, and subject to the same ills as the column. Carbon fouling of the tubes, corrosion and erosion, and thermal shock all contribute to the maintenance problem. Good initial design can go a long way toward providing economical maintenance. Mounting the calandria so that heads are easily accessible and with enough free space to clean tubes or replace them on the spot will save precious operating time and maintenance cost. Here again costs are highly variable and will range from $0.50 to $5 per sq. ft. of heat-exchange surface per yr.

Condensers—Condensers, too, are subjected to all the ills of the calandria except fouling of the tubes. Moreover, they often take frequent pressure shocks, particularly when venting of inert gases is poorly handled. Annual maintenance costs will average $0.30 to $2 per sq. ft. of condensing surface.

Jacketed Pipe Exchangers—For certain special services, the jacketed pipe condenser or heat exchanger is indispensable. Unfortunately, service conditions are so varied that maintenance costs are highly variable, but on the high side, probably because of the special services. Annual costs ranging from $0.75 to $3 per sq. ft. of condensing surface are encountered.

Falling Film Condensers—Probably the cheapest condenser is the plain unjacketed tube type, arranged in vertical banks so that water can be dribbled down over the entire bank. Pyrex brand glass, stainless steel, Duriron, plain steel, and impervious graphite are but a few of the materials used for such condensers. Maintenance costs are fairly reasonable, assuming proper design in the use of fragile materials, averaging from $0.20 to $0.75 per sq. ft. of condensing surface per yr.

DUST AND MIST COLLECTION EQUIPMENT

Electrical Precipitators—These are widely used to remove dust and acid mist from the exit gases of kilns, scrubbers, and other process equipment. Where the service requires lead-covered steel construction, you have the attendant ills of lead subjected to weak acid, temperature changes, and high-voltage electrical discharge between the electrodes. Loosening of the electrode wire, allowing it to flap against the electrode tubes and short circuit, cracking of the lead sheathing and acid attack upon the underlying steel, plus fairly frequent servicing of the electrical apparatus, all contribute to the maintenance bills. For a precipitator handling 10,000 to 15,000 cfm. and containing about 90 electrodes, maintenance will run $5,000 to $8,000 per yr., depending on severity of service and degree of results expected.

Packed Towers—To remove fine dust and entrained mist, packed towers are often employed. Maintenance costs on such equipment are usually low, but the gas-handling capacity is also low so that high initial capital outlay is required to get high capacity. Maintenance costs will run as low as $100 per yr. per 1,000 cfm. capacity.

Baffle Spray Towers—To overcome the low gas-handling capacity of the packed power, baffle spray towers are sometimes used. Maintenance of the sprays, baffles, the lining amount to appreciable sums, and will average $400-$500 per yr. per 1,000 cfm. of capacity.

Bag Filters—For the removal of dust from exhaust gases, there are a number of well known and widely used bag filters of varying types. All have the common problems of bag wear and replacement and repair and servicing of whatever mechanism is used to shake or periodically discharge the dust from the bags. Maintenance averages $200 to $250 per yr. per 1,000 cfm. of capacity.

Cyclones—Centrifugal separators, or cyclones, are often used to separate dust or liquid droplets of coarse and intermediate sizes from a moving gas stream. Where abrasive or crystalline dusts are handled, wear of the upper high velocity section of the cyclone will be severe, and where corrosive liquid droplets are removed, this upper section is subjected to rapid wear and attack. Since these two services form the bulk of the uses for such devices, maintenance costs will run to a surprising $200 to $300 per yr. per 1,000 cfm. of capacity.

SCREENS, SIFTERS, AND MIXERS

Vibrating Dry Screens—Many processes require the separation of a ground or crystallized product into various sizes. Maintenance costs of these devices must include screen replacements due to wear and tear, plus frequent repairs to whatever means is employed to produce the vibrating motion of the screen. The electrical is superior to the mechanical type in this respect, so that costs on the electrical vibrating dry screens will average $500 to $700 per yr. for 50 sq. ft. of screening area, as compared with $700 to $1,000 per yr. for the same size screen in the mechanical type.

Vibrating Wet Screens—These units are commonly employed to remove fuzz, lint, wood chips, grit, or other impurities from slurries. Screens are of fairly small size (1 to 2 sq. ft.), and here again the electrical type is superior to the mechanical type so far as maintenance costs are concerned. Unfortunately, the electrical type will not always furnish the required amplitude of vibration. Costs for a 1-sq. ft. electrical screen will average $150 to $300 per yr. while the same size mechanical screen will run $300 to $500 per yr.

Mechanical Sifters—Many products require sifting to remove lumps or balled material. Such devices must handle many pounds of products and sift them through fairly small mesh screens. Despite spring suspensions, balanced gyratory motion, and improved drive devices, maintenance costs are fairly high, running from $0.10 to $0.20 per ton handled.

Mechanical Mixers and Blenders—A wide variety of mechanical mixers is used in the process industries, ranging from the heavy-duty dough mixer to the ribbon or paddle mixer. Maintenance costs are chiefly for the drives on such equipment and are dependent upon density, degree of mixing, and consistency required in the final product. Batch blenders, as a rule, require heavy repairs to the drive mechanism due to start-stop service, but even continuous mixers and blenders involve high maintenance costs. By classing this equipment under heavy, medium, and light service, and continuous or batch duty, we can synthesize the costs shown in Table II.

Table II—Maintenance Costs for Mixers

(Based on a 50-cu. ft. capacity machine)

Duty	Maintenance Cost, $/Yr. Continuous	Batch
Light	$100–200	$150–250
Medium	200–300	300–400
Heavy	400–500	500–600

CLARIFICATION EQUIPMENT

Batch Clarifiers—These units are usually nothing more than simple tanks equipped with an agitator to obtain initial mixing and an adjustable draw-off pipe to allow decanting of the clear liquid at the end of the settling period. Maintenance costs will compare very closely with those for agitated tanks.

Continuous Thickeners—Construction of the tank body is of many and varied materials, depending upon the service required, and maintenance costs will closely parallel those for tanks constructed of the same material. In addition, however, we have the maintenance of the rake arms, supports, and mechanism, which collect the settled solids and move them to the center of the tank for removal, plus the maintenance of the diaphragm pump usually employed. In non-corrosive services, a 20,000-gal. unit will cost from $500 to $800 per yr. for total repairs, while the same size units in corrosive services will run $2,000 to $3,000 per yr.

PIPING

Process Piping—One of the most important items of maintenance on the modern chemical process plant is the process piping. What a complex array has been used—glass, porcelain, steel, cast iron, stainless steel, plastics of many types, rubber-lined steel, wooden (yes, even wood), rubber hose, concrete, tile, brick-lined steel, many kinds of metal alloys, aluminum, brass, carbon, platinum, lead, silver, and gold. Careful analysis of maintenance costs for process pipelines has yielded the data presented in Table III, based on a 100-ft. run containing 6 fittings and 2 valves.

Service Piping—A similar tabulation for service piping used to distribute steam, water, gases, vacuum, etc., around the plant is given in Table IV.

INSTRUMENTS

In recent years, the development of automatically controlled processes has been one of the chief advances of the chemical process industries and, likewise, one of the most poorly handled as far as maintenance is concerned. The author has seen examples of beautifully designed and instrumented units run by two or three operators per shift, in which banks of instruments and remote controls replaced the labor of three other men each shift, or a saving of nine men per day in operating labor. However, it took the full time attention of five instrument mechanics each day to keep the unit going, or a net saving of only four men per day! This lesson has been costly in some cases, and chemical engineers are learning to approach the instrumentation of processes with greater care.

Rather than try to assign individual costs to instruments, an over-all average shows that a figure of 20-25 percent of the original cost of the instrument will suffice for servicing and maintenance.

CONCLUSION

Smartly designed plants of the future will consider the maintenance angle as fully as the operating aspects—or else suffer the penalty in the form of high maintenance costs. A review of the preliminary plant design by a maintenance expert can save many dollars in the course of the operating life of that plant. This review should cover not only the arrangement, layout, and accessibility of the equipment, but also the type, design, and fabrication of the equipment itself.

Table III—Maintenance Costs for Process Piping

($/yr., based on 100 ft. of pipe containing 6 fittings and 2 valves)

Nominal size	1 in.	1½ in.	2 in.	3 in.	4 in.	6 in.
Steel	$10	$15	$20	$25	$30	$50
Cast iron	6	8	12	16	20	25
Brass	8	12	16	20	25	35
Stainless steel	7	10	14	18	22	28
Rubber-lined steel	—	20	30	40	55	70
Glass	22	30	40	50	60	80
Porcelain	25	35	45	55	75	100
Carbon	30	45	60	80	—	—
Silver	50	75	90	—	—	—
Rubber hose	6	10	18	22	28	36

Table IV—Maintenance Costs for Service Piping

($/yr., based on 100 ft. of pipe containing 4 fittings and 1 valve)

Nominal size	1 in.	1½ in.	2 in.	3 in.	4 in.	6 in.	8 in.	12 in.
Steel (uninsulated)	$4	$8	$11	$15	$19	$26	$40	$60
Steel (insulated)	7	15	20	28	35	45	75	110
Brass	6	9	14	20	27	—	—	—
Cast iron	5	10	16	24	31	42	—	—

PAST, PRESENT AND FUTURE OF A REJUVENATED PROCESS INDUSTRY:

A New Tack for Gum Naval Stores

Change, the partner of progress, is giving us a new gum naval stores industry. Looking back, we can see a new concept arising: Why use degradation products when the original materials offer greater possibilities?

DAVID N. COLLINS and E. L. PATTON

Turpentine and rosin—or gum naval stores, a misnomer that dates back to the days when tar and pitch were used to caulk ships—is an industry that is as difficult to chart today as it was yesterday.

YESTERDAY

The history of the industry gives a clue to its instability. Fifty years ago the processing of turpentine and rosin was a backyard science. A "turpentiner" was overseer of a sizable portion of piney woods, and like the big cotton man, controlled the destiny of the people who depended on his industry.

CRUDE PROCESSING

This turpentiner—call him Grandpa Jones—was a man who didn't know the meaning of chemical processing. His distilling equipment was wood-fired and crude. After distilling off the turpentine, he either threw away the "gunk" (rosin, wood chips, pine needles, dirt, etc.) in the bottom of the kettle or strained out most of the trash and sold it to a soapmaker in Philadelphia. The soapmaker who had bought a 520 lb. barrel of rosin might discover that he had received a top dressing of rosin plus 500 lb. of sand.

A paint maker, in Boston, who had bought Jones' turpentine might discover that his new shipment of 53-c. "turpentine" was really 14-c. kerosene—after he ruined his paint. In the chain of commercial communication from processor to factor to dealer to sales agent to consumer, individual shipments of turpentine or rosin lost all identification. The soapmaker and paint maker had no means of tracing the source of the deceit, however righteous their indignation.

DAVID N. COLLINS and E. L. PATTON are members of the Naval Stores Research Division of the Bureau of Agricultural and Industrial Chemistry, United States Department of Agriculture. Their location: Olustee, Florida.

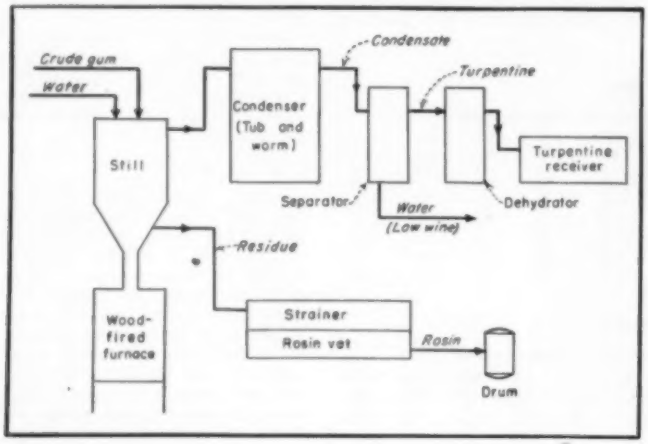
PETROLEUM SOLVENTS COMPETE

Then the salesman for petroleum solvents began to call on the turpentine user. The uses for the liquid did not depend on its chemical composition but only its power as a hydrocarbon solvent. The paint maker who had thinned his paint with gum turpentine at 50 c. a gallon was more than happy to use a petroleum fraction backed by the oil company's research laboratory at less than 10 c. a gallon.

Gum rosin fared a little better. Rosin is used both as a cheap organic acid and as cheap resin; no competitors appeared in the acid field, and better resins for paints were themselves mostly rosin derivatives. Wood rosin (from pine stumps) appeared in 1909, and captured some of the market from gum rosin by a combination of consumer research and a more uniform product.

ROSIN SUPPORTS THE INDUSTRY

Barring the extra sales during wartime, the continuing demand for rosin has supported the gum naval stores industry for the past 30 years. As industrial sales of turpentine dropped, efforts were made to fill the gap by retailing packaged turpentine in small containers. This began about 1925, and grew to nationwide proportions by 1940. This packaged turpentine now consumes more than 90 percent



YESTERDAY the old fire stills usually consisted of large copper kettles heated directly by a wood fire. The kettle was connected to a coil of copper pipe in a wooden tub. The turpentine was distilled off with water and separated by gravity.

Rosin, remaining in the kettle was removed and strained, while still in the molten condition, at the end of each run. Cut (above) and flowsheet (left) show the fire still as it operated in 1935 before the Olustee Process.

of all gum turpentine produced in this country, but the total production is less than that of 40 years ago.

TODAY

Today, the processing situation has changed radically thanks to the Department of Agriculture. The Federal Naval Stores Act of 1923 put an end to misbranding and adulteration of gum turpentine and rosin. In 1931, the Department established its Naval Stores Station at Olustee, Fla.

The equipment of the station included a commercial turpentine fire still, a building to house chemical processing equipment and in 1935, a chemical laboratory. In 1941, the government's Olustee process (see cut)—the most significant development in the history of gum naval stores processing—was introduced.

OLUSTEE PROCESS

Introduction of the Olustee Process so aided the system of central plants (the farmers would only collect the gum, sell it to the central plants to process) that the 12 plants which in 1941 processed 33 percent of the crude gum produced, had increased to 29 plants in 1951, and their share of production was more than 90 percent. Estimates of the present number of gum farmers and those on the farm who work the pine trees run as high as 40,000, and the smallest processing plant has a capacity of about 100 bbl. of gum per day.

GOVERNMENT SUPPORT

One of the paradoxes of gum naval stores is this: Contrary to most industries; production of pine gum tends to contract when demand is high and to expand when demand is low. During periods of low national employment, the supply of workers expands, thus increasing production. When business conditions improve, some farmers and laborers shift to better paying jobs in industry. Commodity Credit Corp. loan programs for the gum naval stores industry, which have been in effect for the last 13 years, have helped to reduce price fluctuations by accumulating stocks during those years in which demand was low and releasing these into commercial channels as demand expands. Following World War II, substantial stocks were accumulated by CCC under the support programs for the crops of 1947, 1948, and 1949.

KOREA'S EFFECT

As a result of increased foreign and domestic demand following the action in Korea, prices advanced sharply until ceilings were applied in late January 1951. In April the price of turpentine fell to 75 c., had dipped to 65 c. by the end of July.

Effective Jan. 30, 1951, export licenses were required for rosin and turpentine. These are needed to insure adequate supplies to cover essential domestic uses during the current and following crop years. Supplies of naval stores are expected to become increasingly tight. CCC stocks have been reduced to a low level, are expected to fall lower still.

ROSIN DEMAND STRONG

Domestic demand for rosin in 1951-52 will continue strong. The high rate of industrial activity means large requirements for rosin not only in its customary uses, but also in new uses that are constantly being developed. Export demand also is likely to remain strong. Rearmament in Western European countries is getting under way. This is increasing the rate of industrial activity abroad. Many foreign countries have increased supplies of dollar exchange as a result of large U. S. purchases abroad. These include rubber, tin, chemicals and other goods in short supply in this country.

OUTLOOK FOR TURPENTINE

Important chemical uses have increased the outlets for turpentine. Quite recently a substantial market has opened up in insecticide manufacture and the production of additives for lubricating oil exposed to extremely high temperatures.

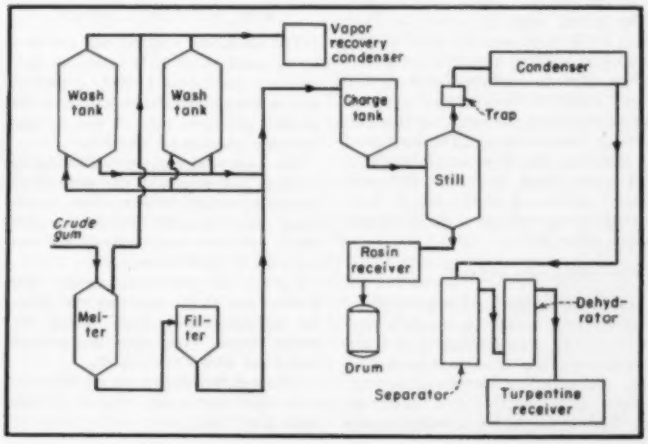
OUTLOOK FOR ROSIN

Total production of gum and wood rosin since 1900 has not shown any clear trend, either upward or downward. Peaks of about 2 million drums annually have been reached twice in each decade since 1900, (*Review and Outlook, Naval Stores*, bureau of Agricultural Economics, USDA, 1951).

There were major declines in output in World War I and II when labor was drawn out of the piney woods by military service and by higher wages in wartime industry. Now it looks like history will repeat as far as labor supply is concerned, because of the effect that current economic conditions may exert in draining manpower from gum gathering. The low point in total production of gum and wood rosin in World War II was 1.3 million drums in 1944. This was materially above the

TODAY the Olustee Process produces a cleaned gum containing only turpentine, rosin and water. The crude gum is diluted with more turpentine, heated in a closed kettle. Trash and sand are screened out and the gum is washed with hot water.

Advantages of the process: More rosin could be obtained from a barrel of crude gum than by older methods, and the rosin was of better quality. Yield of turpentine was unaffected but it was on rosin yield that the industry's profits depended.



low point of 1.0 million drums in World War I. Output of wood rosin, of relatively slight importance in the 1920's has increased to over 40 percent of total rosin output by 1939 and currently amounts to about 65 percent of the total.

ROSIN'S USEFULNESS

Major uses of rosin are for "sizing" or impregnating various types of paper and paper board; in protective coatings such as varnishes, enamels, and paints, in chemicals and pharmaceuticals, and in yellow laundry soap. There are also a dozen or so minor uses for rosin.

TOMORROW

The present status of the industry may be such that it is in the same position as the inventor who spent 20 years inventing a new buggy whip just as automobiles came into general use. Both turpentine and rosin are trade terms; they have legal definitions but no chemical ones; and both products are chemicals designed for sale to chemical industries. Benzene, for instance, is a chemical compound, with recognized chemical properties. Turpentine, on the other hand, is the liquid portion distilled from the gum of *Pinus caribea* and *Pinus palustris*, and rosin is the residue from the distillation. Both of these materials are mixtures of various chemical compounds. To continue in chemical processing even the best materials will have to approach the goal of chemical individuality, otherwise a replacement which is more adaptable to mass production will be found.

If not turpentine and rosin for sale, what then?

ESTER GUMS, GLOSS OIL

What about rosin derivatives—ester gums, gloss oil, and the like? This is the most available field for the processor. These products are themselves chemical intermediates in the paint industry; their manufacture requires remelting the rosin and reaction at high temperatures. The heat used in remelting would be saved by use of hot rosin direct from the still, and several processing plants already have operating agreements with synthetics plants close by.

RIGHT FROM THE KETTLE

Of longer range (and more eventual importance) is the use of crude pine gum directly as a raw material, without intermediate conversion to turpentine and rosin, or the use of a component of turpentine as a basic raw material. Distillation at temperatures above 300 deg. F. is a destructive process, particularly on such heat-sensitive resin acids as the components of crude pine gum. Why use degradation products when the original materials offer greater possibilities? Laboratory research along this line is in process at the Department's Naval Stores Research Division in Olustee, Fla. The most advanced development, now in the pilot-plant stage, is maleo-pimaric acid, a crystalline compound of maleic anhydride and the levopimaric acid present in crude pine gum. It is suitable for uses in varnishes. It can also be used in making printing inks and emulsifiers.

NEW PRODUCTS FROM TURPENTINE

The method for making pinane hydroperoxide from α pinene, the major component of turpentine, for use as a catalyst in the polymerization of "cold rubber" is another recent accomplishment of the Naval Stores Research Division of the U. S. Department of Agriculture.

ROSIN AND DERIVED PRODUCTS

About 90 percent of rosin consists of acids. Because the acids while structurally quite similar to each other, have a number of different chemical and physical properties, investigation of them individually is a sound basis for research directed toward a wider utilization of rosin.

In all this profusion of chemical sprouts from an agricultural industry, what will happen to the Jones boys? We cannot tell. Young Jones and his processing plant have a head start in opening up a new field which until now has been left alone by the skilled chemical industries. His only certainty will be that of changes to come, requiring more and more adherence to the principles of professional engineering operation and control. Beyond that, his reactions will differ as widely as do the individuals in the group he typifies, the gum naval stores industry. Whatever his reactions, though, the industry will progress.

LITTLE BONER

The Off-Spec Motor

The equipment engineer was not in a happy mood at all. He'd been sent to a remote chemical plant to start up some of his company's machinery—and now he couldn't get it to run. It was an embarrassing situation for everybody.

The local plant engineer, a chemical by training, had supervised the installation. Everything seemed to be in order. Everything except possibly the main motor, which had been bought locally and was not quite to specifications.

Cursing all purchasing agents who couldn't pass on the specs they were given, the equipment man again pushed the starter button. And again the overload kicked out after a few seconds.

This had been happening all afternoon as he tried leaving the cover of the box open, first turning over of the motor by hand, and various other tactics that could usually be counted upon to bring balky machinery into operation. But nothing he tried would do the trick.

After a final check of all equipment with an electrician, he gave up at last and struck out for the nearest city—a hundred miles away—to get a new starter box to suit the off-spec motor.

While he was away, the plant engineer decided to take a good look at the starter that seemed to be causing all the trouble.

The wiring diagram showed that current entering the box split between the heaters and a set of starting contacts. The latter had no heaters and were designed to cut out automatically after the motor had had time to get up to speed.

Vaguely remembering his current laws, the plant engineer figured out that there shouldn't be any appreciable current flowing through the heaters while the starting contacts were closed, as the latter circuit should be practically without resistance. If the heaters were kicking out, then wasn't there a resistance somewhere in the starting circuit?

Picking up a dry rag, he rubbed the starter contacts for a few seconds to clean them. That was all it took.

By the time the irate equipment man returned from the city almost six hours later, the motor setup was functioning perfectly.

Why not send in your true "little boner" story? Address: Editor, Chemical Engineering, 330 West 42nd St., New York 18, N. Y.

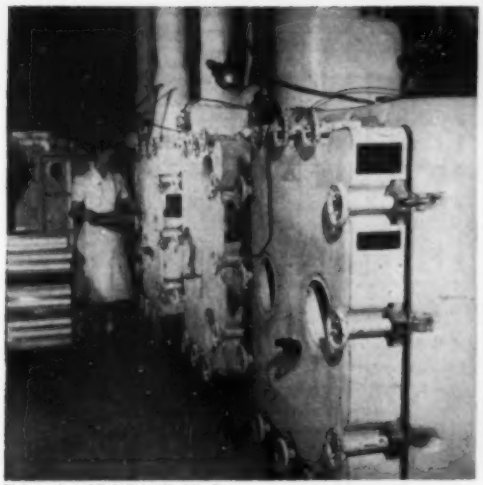


Photo courtesy of P. J. Stokes Machine Co.

Simple sublimation is exemplified in freeze drying of antibiotics.

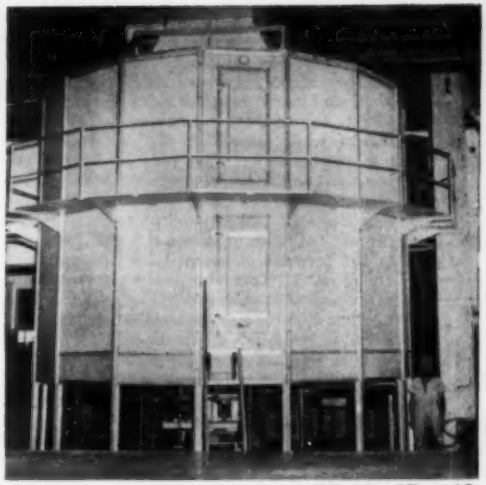


Photo courtesy of Wyssmont Co.

Slightly modified a Turbo dryer becomes an entrainer sublimer.

SUBLIMATION

Sublimation is a little-known unit operation on which there is scanty know-how. Most of the theory in this first comprehensive article was developed by the author to supply information he needed, but which did not previously exist.

MELVIN NORD

CHEMICAL ENGINEERING REPORT—SEPTEMBER 1951

The unit operation of sublimation has long been regarded as a step-child in chemical processing. This is due, at least in part, to a misunderstanding of the applicability of the process, as well as to a lack of analysis of the fundamental principles of the process. This article presents an analysis of the principles of sublimation, and indicates under what conditions a sublimation process will prove successful.

What sublimation is

In the usual sense of the word, sublimation means the formation of a vapor directly from a solid, without passing through the liquid state. For a pure substance this process is indicated by the line *AB* in Fig. 1, which is a phase diagram for iodine. The word sublimation is also used to represent the reverse process, i.e., a process in which a vapor is condensed directly to the solid state, without passing through the liquid state. An "ordinary" vaporization (or distillation) process, i.e., one in which the solid first melts and then vaporizes, is indicated by the path *CD*. The temperature at which the vapors form in either case is indicated by the point at which the respective dotted (constant pressure) lines intersect the vapor pressure curve, i.e., the "sublimation curve" or the "vaporization curve."

At lower temperature

It will be noted that sublimation always occurs at a lower temperature than distillation. Indeed this is often the principal advantage of sublimation. Whether a substance will normally sublime, or melt and then vaporize, depends on the location of the triple point, which is the point of intersection of the sublimation, vaporization, and melting-point curves. It is evident that vaporization of a solid without prior melting can be accomplished only at pressures (or partial pressures) below that of the triple point.

MELVIN NORD, associate professor of Chemical Engineering at Wayne University, Detroit, consulting chemical engineer and patent attorney, is a frequent contributor to our pages. Having had earlier experience with sublimation applied to phthalic anhydride, phthalimide and uranium hexafluoride, he later found need for a comprehensive knowledge of sublimation which did not exist.

If the triple point of a substance is above atmospheric pressure, the substance will normally sublime; an example is "dry ice" (solid carbon dioxide). If, on the other hand, the triple point of the substance is below atmospheric pressure—as is the case for iodine and for most substances which are "normally" solid—sublimation can be accomplished only by reducing the pressure (or the partial pressure) below atmospheric pressure. It follows, therefore, that sublimation will ordinarily require the use of vacuum (in order to reduce the total pressure), or the presence of an inert gas or "entrainer" (in order to reduce the partial pressure of the substance to be sublimed). The former process is called "simple sublimation," while the latter is called "entrainer sublimation."

Two kinds of sublimation

As a method of separation, sublimation is competitive with other unit operations such as distillation, crystallization and solvent extraction. Certain inherent characteristics make it unique and in some cases give it a distinct advantage over other separation methods.

Except for less usual cases where the residue rather than the vapor is the valuable material—for example, in freeze drying—sublimation processes involve the formation of a solid final product direct from a vapor. This means that the equipment, especially the condenser, may have to be very large. In addition, various auxiliaries may be needed. There are several cases where sublimation is likely to be a suitable separation method:

When sublimation fits

1. The material is unstable, temperature-sensitive, or oxidation-sensitive, and it is necessary to vaporize it below its melting point. Here the vapors must necessarily condense as a solid. This case includes not only temperature-sensitivity and decomposition of the product itself, but also instances where the impurities present may decompose into materials of sufficient vapor pressure to carry over into the product.

2. Although the material is distillable, it is desired to produce the solid product by condensation direct from the vapor without passing through a liquid stage. This may be because a certain crystal type, or size, or certain appearance of product is preferred. Also, a sublimate is normally a finished product which does not need further processing, whereas a solidified liquid may have to be pulverized or flaked before it can be packaged.

3. The material to be recovered is non-volatile and heat-sensitive, and is to be separated from a volatile material. Freeze drying is an example here, sublimation of the ice leaving behind the heat-sensitive antibiotic, blood plasma or other material.

4. The material to be separated has a high melting point and at elevated temperatures presents problems such as corrosion of equipment.

5. The volatile material is mixed with a high percentage of non-volatile material, but can be recovered economically by sublimation.

6. A mixture of volatile materials is to be separated. Here preferential condensation by control of condenser temperature and entrainer ratio (if an entrainer is used) may make sublimation the preferred method.

7. A solid product is to be recovered from a wet feed stock. Ordinarily two distinct operations of drying and purification would be needed. Sublimation may enable the result to be attained in a single operation.

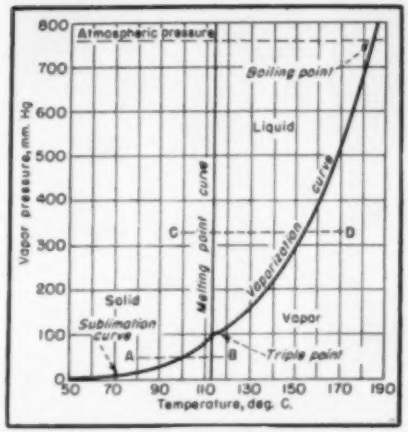


Fig. 1—Phase diagram for iodine illustrates principle of sublimation at temperatures below triple point.

Sublimable materials defined

Sublimation is not a very widely used unit operation compared with distillation, but this is less a reflection on its suitability than it is a recognition of the fact that many materials are not susceptible to its use. To be sublimable a material must be normally solid and it must have a reasonably high vapor pressure at fairly low temperature. Or, as are the inorganics, it must be heat-stable at elevated temperatures. Of those materials that are susceptible to sublimation a fairly high percentage are actually being sublimed. There is evidence that the proportion is increasing. Some of the materials now being sublimed commercially are listed in the accompanying tabulation.

MATERIALS SUBLIMED COMMERCIALLY

Anthracene	Magnesium
Anthranilic acid	Naphthalene
Anthraquinone	β-Naphthol
Benzanthrone	Phthalic anhydride
Benzoic acid	o-Phthalimide
Calcium	Pyrogallol
Camphor	Salicylic acid
Ice (in freeze drying)	Sulphur
Iodine	Uranium hexafluoride

Simple sublimation

Simple sublimation is conducted in the manner indicated in Fig. 2. It is necessary to evacuate the air from the apparatus down to the operating pressure before the sublimation process is started. It is also necessary thereafter to continue pulling a vacuum with a pump or ejector for two reasons: (1) To remove air in-leakage, and (2) to permit mass flow of the vapors from the sublimer to the condenser. The second of these requires further explanation. Let us suppose we have a perfectly air-tight system which has been evacuated down to 75 mm. Hg and that we propose to sublime iodine in the apparatus. If we heat the solid iodine in the still up to about 110 deg C., it will exert a vapor pressure of 75 mm. Without further pumping air will remain in the system, and the total

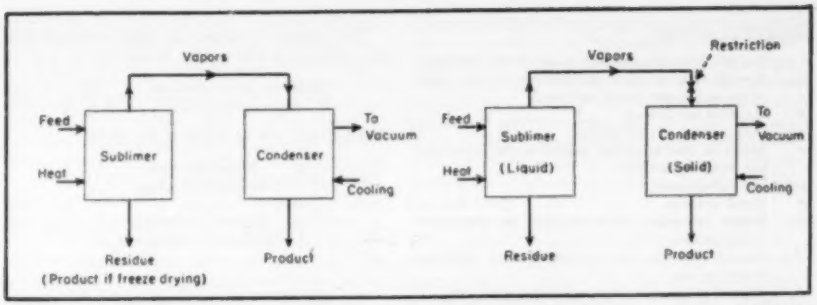


Fig. 2—In simple sublimation vacuum prevents noncondensible gas build-up.

Fig. 3—A restriction in vapor line permits sublimation from the liquid state.

pressure will rise to 150 mm. The partial pressure of iodine in the vapor space of the sublimer will be 75 mm. whereas the partial pressure of iodine in the vapor space in the condenser will be zero initially and can be maintained at a value below 75 mm. by maintaining a condenser temperature below 110 deg. C. There will therefore be a partial pressure driving force, which will cause diffusion of iodine vapors from the sublimer to the condenser, where they will condense as a solid. A "sublimation process" may therefore be said to be occurring.

How inert gas stops process

However, the rate of diffusion of a vapor through an inert stagnant gas is virtually nil where the length of diffusion path is anything greater than a mere "film." As a practical matter, the presence of an inert gas such as air in a closed system would prevent the sublimation process from proceeding at an appreciable rate. But, when the air is removed by pumping, the vapors can move in mass flow to the condenser from the sublimer as fast as they are formed. For this reason, the vacuum pump should not be turned off until virtually all the air has been removed and replaced by vapors of the substance subliming. Even after this has been accomplished, continued pumping is generally necessary to remove air which leaks into the system.

The requirements of a successful simple sublimation process therefore include reasonably good heat transfer in the sublimer and in the condenser, and a satisfactory vacuum system.

Heat transfer problems

Heat transfer to the solid in the sublimer is generally rather difficult. If the solid is in large lumps, heat transfer by conduction will be slow. Since vaporization occurs only at the surfaces of the solid, it is advantageous to begin with a finely divided material. However, this creates a large amount of small void spaces, which tend to act as thermal insulation. The most satisfactory way to overcome this difficulty is to introduce agitation. The apparatus may be very similar to (or may actually be) a jacketed vacuum pan dryer or a vacuum rotary dryer. Another alternative is to distribute the solid in thin layers in trays, the trays being placed on hollow shelves which are heated with steam or other heat-transfer medium. This type of apparatus can be similar to (or may actually be) a vacuum shelf dryer. For example in "freeze-drying" of antibiotics, the sublimers are essentially conventional vacuum shelf dryers. Here ice is sublimed.

In general, the simple sublimation of solids greatly resembles vacuum drying, since a solid is to be heated and vapors are to be formed and removed. The difference is that in sublimation liquid material is not ordinarily present in the void spaces, so that heat transfer is slower than in drying.

Improving heat transfer

In the case of materials which are not heat-sensitive—virtually limiting the field to inorganic substances, such as iodine and magnesium—direct-firing in retorts may be the most economical method of vaporizing the solid material.

At best, heat transfer rates are sure to be low when heating a solid which is to be sublimed. If it is possible to add a liquid in the sublimer to aid in the heat transfer process, this will greatly speed it up. However, this can be done only if the liquid has a much lower vapor pressure than the material to be sublimed. This is not usually the case, except with certain expensive oils. But it can be done if the presence of condensed liquid along with the sublimate is not disadvantageous, e.g., anthracene and water.

Subliming from a melt

It is also possible to obtain liquid in the sublimer by melting of the material to be sublimed. But this will mean condensation as a liquid unless there is sufficient pressure drop in the line between the sublimer and the condenser. A solid can be produced since with enough pressure drop it is possible for the condenser pressure to be below the triple point pressure although the sublimer pressure is above. If there would normally not be sufficient pressure drop to permit exact balancing as required by this method, a restriction may be placed in the line for this purpose, as in Fig. 3. This restriction should be near the condenser, so that condensation of solids will not occur in the vapor line when the expansion of the vapors across the restriction takes place. Since the vapors are at a low pressure, they should be expected to behave as an ideal gas. That is, no drop in temperature should occur across the restriction. However, it is a good idea to superheat the vapors slightly in the vapor line, in order to prevent condensation at that point.

If a nonvolatile impurity is dissolved in the material to be sublimed—which is very often the case—the melting point of the material will be reduced below the triple point for the pure substance. It may therefore be possible to obtain liquid in the still at a temperature below the

NOMENCLATURE

- c_{ent} Specific heat at constant pressure of entrainer.
- c_{sup} Specific heat at constant pressure of the vapor of the substance being sublimed.
- E Relative saturation.
- ΔH Latent heat of sublimation.
- n Moles of cold entrainer added in the condenser per mole vaporized.
- p Partial pressure.
- P Total pressure.
- P_c Vapor pressure corresponding to condenser temperature.
- P_s Vapor pressure corresponding to sublimer temperature.
- p_s Partial pressure in vapors leaving sublimer.
- P_{TP} Vapor pressure at the triple point.
- r Moles of air in-leakage per mole vaporized.
- T Temperature.
- t Cold entrainer temperature.
- T_c Condenser temperature.
- T_s Sublimer temperature.
- TP Triple point.

triple point of the pure substance, in which case no restriction is needed in the vapor line in order to obtain condensation of solid in the condenser.

Simple sublimation tools

In the case of vacuum operation, condensation ordinarily requires the use of a jacketed vessel as condenser. In this case, a relatively hard, adherent deposit of crystals builds up on the walls of the condenser. Since this retards heat transfer, it is generally desirable to remove this deposit by a scraper type of agitator. The solid deposit thus obtained does not have the snowy appearance which is characteristic of sublimates formed by entrainer sublimation. Thus the principal utility of simple sublimation is separation of a volatile solid from a nonvolatile solid at a low temperature.

The equipment used in simple sublimation processes should be as air-tight as possible, since increased air in-leakage increases the required size of vacuum producer, and decreases the yield of sublimate. The amount of vapor which is uncondensed in the condenser depends on the in-leakage and on the still and condenser temperatures, as indicated by the following:

Effect of air in-leakage

Assume that r moles of air leak into the apparatus per mole of material vaporized. The total pressure P in the condenser will then be greater than the vapor pressure P_s corresponding to the still temperature, or

$$P = P_s(1 + r) \qquad (1)$$

The number of moles of vapor uncondensed per mole of air leaving the condenser is

$$\frac{\text{Moles vapor uncondensed}}{\text{Mole air in-leakage}} = \frac{P_c}{P - P_c} \qquad (2)$$

The percent loss of vapor is therefore:

$$\% \text{ loss} = \left(\frac{\text{Moles vapor lost}}{\text{Mole air in-leakage}}\right) \times \left(\frac{\text{Moles air in-leakage}}{\text{Mole mat'l vaporized}}\right) \times 100 \qquad (3)$$

or

$$\% \text{ loss} = \frac{r\,(P_c/P_s)}{(1 + r) - (P_c/P_s)} \times 100 \qquad (4)$$

Effect on losses

It is apparent from Eq. (4) that as the in-leakage ratio r approaches zero, the percent loss approaches zero, and that as r increases without limit, the percent loss increases to 100 percent. Similarly, as (P_c/P_s) approaches zero, the percent loss approaches zero, and as (P_c/P_s) approaches unity, the percent loss increases to 100 percent. Thus for good recovery, low air in-leakage and a relatively low condenser temperature (compared to the sublimer temperature) are required. Since the vapor pressure decreases rapidly with temperature, it is not necessary that the condenser temperature be very low. For example, in the case of iodine, a reduction in temperature from 100 deg. C. to 70 deg. C. gives a value of (P_c/P_s) of 0.11. In this case, the loss should be less than 1 percent if the in-leakage is reasonably small.

Need for a cold trap

In order to protect vacuum pumps from contamination with uncondensed materials, it is good practice to place a "cold trap" in the line between the condenser and the vacuum pump. This may be a small condenser operated at a much lower temperature than the product condenser. If the temperature in the cold trap is low enough, it is evident from Eq. (4) that virtually none of the sublimed material will reach the vacuum pump.

A batch process

Because simple sublimation operates under vacuum, it is inherently a batch process. On the other hand, sublimation with an entrainer operates at atmospheric pressure and so can be adapted to continuous processing.

As has been indicated above, the presence of a stagnant inert gas prevents a sublimation process from being successful. Only two methods are available to avoid this difficulty, i.e., either to

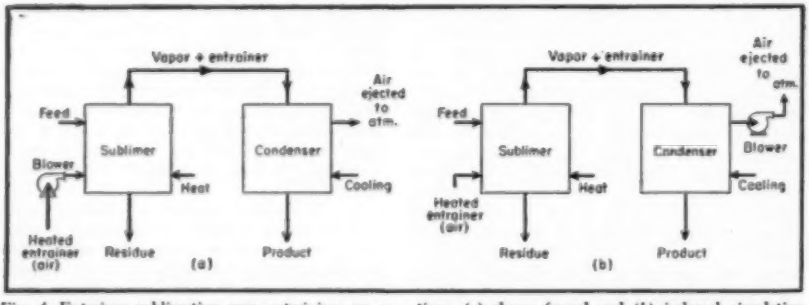


Fig. 4—Entrainer sublimation uses entraining gas or vapor for partial pressure effect, as in steam distillation. (*a*) shows forced and (*b*) induced circulation. Natural circulation limits production unduly.

remove the air (as in simple vacuum sublimation), or to cause the air to keep moving from the still to the condenser at a reasonably rapid rate. The latter process is called "entrainer sublimation" because the inert gas "entrains" or carries vapors from the still to the condenser.

Entrainer sublimation

In general, there are three main ways of conducting an entrainer sublimation, depending on the handling of the entrainer and the means of supplying heat. The simplest method, shown schematically in Fig. 4, involves the entrance of air (or other entrainer) into the still, and its ejection from the condenser to the atmosphere. The flow of entrainer may be established by means of a blower ahead of the still (Fig. 4a), or a fan after the condenser (Fig. 4b). In the first case, the sublimation is run at a pressure very slightly above atmospheric; in the second, it is very slightly below atmospheric pressure. In this method, and in the next to be described, the material is heated by direct contact with heated surfaces.

Recirculation method

In the second method, shown schematically in Fig. 5, the entrainer is not removed from the system, but is recirculated. This process also is run at atmospheric pressure. It is of importance especially where the entrainer is not air, but is a gas having some value, such as carbon dioxide. In principle, at least, it might be possible to obtain recirculation by natural convection instead of using forced circulation. However, the increased heat transfer rates and productivity possible with forced circulation appear to make natural convection impractical. While it is not absolutely necessary that the entrainer be hot as it enters the still, this is very desirable, since external heat transfer to the gas is easier than heating it in the sublimer. The economically optimum temperature of the air entering the sublimer is slightly above the temperature at which the sublimer operates. If the entrainer is slightly hotter than this temperature, its superheat will prevent any condensation from occurring in the vapor line.

Hot entrainer method

The third method of entrainer sublimation may also be illustrated by Fig. 5. Its difference from the second method lies in its means of supplying heat to the material by contact with hot entrainer, rather than hot surfaces. Or, a variation is to supply the heat by a combination of hot surfaces and hot entrainer. Where all the heat comes from hot surfaces, as in method (2), jacketed or direct-fired vessels are generally used, which as a rule limits the process to batch operation. Where heat comes from the hot entrainer, the process uses an adaptation of conventional continuous air drying equipment. To avoid the use of an excessive ratio of entrainer to sublimate (which means an extra load on the condensers), it is usual to provide means for reheating the entrainer a number of times within the sublimer.

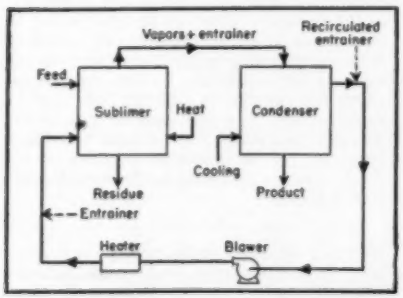


Fig. 5—Recirculation of entrainer is commonly practiced to increase efficiency of sublimation processes.

Effect of partial pressure

The processes illustrated in Figs. 4 and 5 are very similar in principle to those of simple sublimation, except that a reduced sublimer temperature is obtained by the partial-pressure effect of the entrainer, instead of by using vacuum. The principles are the same as those which have been developed for steam distillation. The ratios of moles of vapor per mole of entrainer leaving first the sublimer, then the condenser, and finally the percent vapors uncondensed, are:

$$\frac{\text{Moles vaporized}}{\text{Mole entrainer}} = \frac{P_s}{760 - P_s} \qquad (5)$$

$$\frac{\text{Moles uncondensed}}{\text{Mole entrainer}} = \frac{P_c}{760 - P_c} \qquad (6)$$

$$\%\ \text{uncondensed} = \frac{P_c\,(760 - P_s)}{P_s\,(760 - P_c)} \times 100 \qquad (7)$$

Thus high still temperatures and low condenser temperatures are desirable. Eq. (7) can also be obtained directly from Eqs. (4) and (1), by substituting $P = 760$.

Recycle recovers vapors

It will be noted that where the entrainer is ejected to the atmosphere as in Fig. 4, the amount uncondensed represents an actual reduction in yield. On the other hand, if the entrainer is recycled, as in Fig. 5, the uncondensed vapors are also recovered, along with the entrainer. Comparing the percent uncondensed in entrainer sublimation with that in simple sublimation for the case of iodine, with still and condenser temperatures of 110 deg. C., and 70 deg. C., respectively, we obtain the following results: For simple sublimation: less than 1 percent uncondensed, if in-leakage is reasonably low (i.e., $r = 0.1$); for entrainer sublimation: 9.7 percent uncondensed. The high value calculated for entrainer sublimation occurs because the ratio r of moles of entrainer per mole vaporized is 9.1, i.e., there is over nine times as much inert gas as vapor leaving the sublimer.

Criteria for good recoveries

It is obvious, therefore, that if good recoveries are to be obtained (assuming no recycling), relatively high sublimer temperatures are necessary in entrainer sublimation. In fact, it is generally desirable to raise the operating temperature above the triple point temperature for this reason. Since this also greatly aids heat transfer to the material, entrainer sublimations of the first two types generally utilize temperatures above the triple point, so that melting occurs first, followed by vaporization. However, melting is not always desirable, owing to fouling of the heat transfer surfaces, or possible decomposition of the material.

To obtain condensation as a solid in the condenser, Fig. 1 shows that it is necessary that the partial pressure in the condenser be reduced below the triple point. Since considerable entrainer is already present, it is generally assumed that

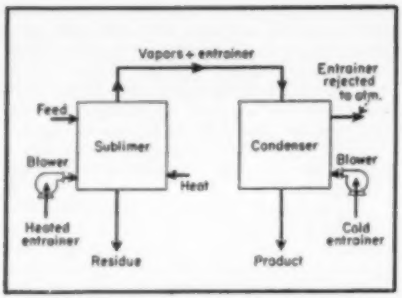


Fig. 6—Quenching, by introduction of cold entrainer to the condenser, is sometimes used to improve crystallization.

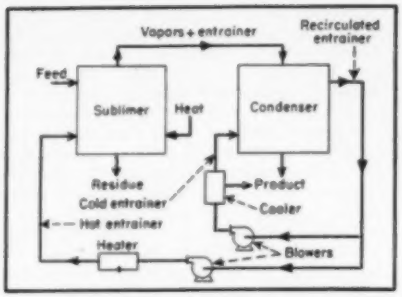


Fig. 7—Both quenching as in Fig. 6, and recirculation of entrainer, as in Fig. 5 can be combined in a single flowsheet.

no great harm can be done by adding additional air in the condenser for this purpose.

Quenching with additional air

Indeed, the addition of air in the condenser can serve two other important purposes besides permitting the use of temperatures above the triple point in the sublimer. If the air is cold (i.e., unheated) it is a good cooling medium, since it is mixed directly with the vapors to be condensed. In addition, since the condensation takes place within the vapor itself, rather than on the walls of the condenser, it promotes the production of a "snow," rather than a crystalline deposit. When the latter factor is important, it is good practice to admit the air to the condenser in such a way that the vapors must condense within the vapor space. In this case, it can be assumed that most of the cooling effect is obtained from the cold air admitted to the condenser, rather than from external cooling. This method is the one generally employed in entrainer sublimation processes. It is often called "quenching," and is illustrated schematically in Fig. 6. Recirculation can also be practiced along with quenching, as shown in Fig. 7. But since this practice usually will result in additional condensation in the entrainer cooler, provision must be made to clean it automatically.

Cold vs. hot entrainer

In any entrainer quenching process, it is important to control the relative amount of cold and hot entrainer. If insufficient cold entrainer is added to the condenser, the vapor may condense as liquid instead of solid. This will be the case if the partial pressure in the condenser is still above the triple point pressure. In order that the partial pressure in the condenser be no greater than the triple point pressure, the ratio of entrainer to vapor in the condenser must be at least:

$$\frac{\text{Moles entrainer in cond.}}{\text{Mole vaporized}} = \frac{760 - P_{TP}}{P_{TP}} \qquad (8)$$

The ratio of entrainer to vapor leaving the sublimer is (inverse of Eq. 5):

$$\frac{\text{Moles entrainer in sublimer}}{\text{Mole vaporized}} = \frac{760 - P_s}{P_s} \qquad (9)$$

where P_{TP} and P_s are the vapor pressures corresponding to the triple point and the sublimer temperature, respectively. These entrainer ratios are plotted against sublimer temperature for iodine in Fig. 8. Curve A in this figure represents the minimum entrainer ratio in the sublimer (assuming equilibrium is attained in the sublimer between the entrainer and the material being vaporized). Curve B represents the minimum entrainer ratio in the condenser for condensation as a solid (assuming sufficient external cooling is available to reduce the temperature below the triple point temperature.

Relation to triple point

It will be noted that if the sublimer temperature is below the triple point temperature, relatively large amounts of hot entrainer are required in the sublimer, and no cold entrainer need be added in the condenser. On the other hand, if the sublimer temperature is above the triple point (so that its contents is melted), then a constant and relatively small total amount of entrainer is required. The minimum amount of hot entrainer required in the sublimer is given by the Curve A in Fig. 8. The minimum amount of cold entrainer to be added in the condenser is given by the difference in ordinate between Curves A and B. The minimum amount of cold entrainer required to be added in the condenser is thus

$$\frac{\text{Moles entrainer added in cond.}}{\text{Mole vapor}} = \left(\frac{760}{P_{TP}} - \frac{760}{P_s}\right) \qquad (10)$$

As a practical matter, the amount of cold entrainer required may be considerably greater than this if external cooling is ineffective.

Effect of saturation

In Eqs. (9) and (10) it is assumed that the entrainer is fully saturated at the temperature of the sublimer. This can be true only if the entrainer is heated by contact with heated surfaces and the entrainer serves only to convey the vapor to the condenser. In the common case where the entrainer is used for both heat and vapor transfer, then the entrainer can be only partially saturated. This partial, or relative, saturation (cf. the humidity of air mixed with water vapor) is expressed by the ratio E, where E is defined by:

$$E = p_s/P_s \qquad (11)$$

Here p_s is the actual partial pressure in the vapor space in the sublimer. To be more precise in Eqs. (9) and (10), the quantity P_s should therefore be replaced by $E\,P_s$.

If the relative saturation is small, no entrainer

Effect of excess entrainer

may be required to be added in the condenser (assuming sufficient external cooling), even though the sublimer temperature is considerably above the triple point temperature. However, without recirculation, the yield will be reduced because of the presence of excess entrainer. Also, since the excess entrainer is all hot, the cooling load on the condensers will be greater. This suggests the obvious solution that, if the material can be melted and the entrainer blown through it, then the highest thermal efficiency will be obtainable. Here operation of the sublimer is exactly analagous to that of a steam still and relative saturations exceeding 90 percent are readily obtainable. In certain cases, as shown later, there may be an advantage in blowing some hot air over the surface of the sublimer contents, in order to dilute the vapors with hot entrainer. This has the purpose of avoiding "sintering" of the product.

Percent uncondensed

Assuming the partial pressure of vapors in the condenser to be below the triple point pressure, this does not necessarily mean that all the vapors will condense. The amount remaining uncondensed depends on the condenser temperature. The amount of vapor remaining uncondensed per mole of entrainer is given by Eq. (6). The minimum number of moles of entrainer in the condenser per mole vaporized is given by Eq. (8). Combining these two equations,

$$\% \text{ uncondensed} = \left(\frac{\text{Moles vapor uncondensed}}{\text{Mole entrainer in cond.}}\right) \times \left(\frac{\text{Moles entrainer in cond.}}{\text{Mole vaporized}}\right) \times 100 \qquad (12)$$

$$\% \text{ uncondensed} = \left(\frac{P_s}{760 - P_s}\right) \times \left(\frac{760 - P_{TP}}{P_{TP}}\right) \times 100 \qquad (13)$$

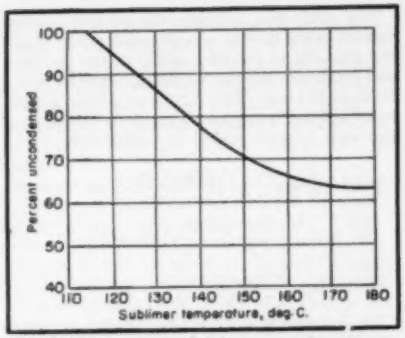


Fig. 9—How percent of iodine uncondensed varies with sublimer temperature, with minimum cold entrainer for quenching, negligible external cooling.

Eq. (13) is similar to Eq. (7)—which applies when the sublimer temperature is below the triple point and no "quenching" is required—except that P_{TP} replaces P_s. Comparing the two equations, it is evident that the percent uncondensed is minimized when the sublimer temperature is equal to or greater than the triple point temperature. If sufficient external cooling is available, all temperatures above the triple point temperature are equally advantageous. However, when external cooling is inadequate, there may be an optimum sublimer temperature which will minimize the percent uncondensed. As the temperature increases above the triple point temperature, the cooling requirements increase because of the higher temperature; on the other hand, more cold entrainer is available for cooling, so that an optimum sublimer temperature may be found by means of a heat balance.

Criteria for efficiency

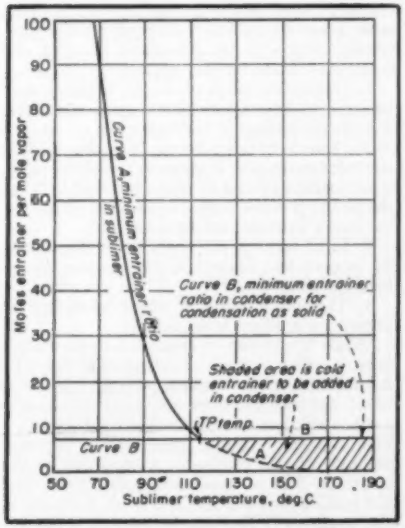


Fig. 8—How entrainer ratio varies with sublimer temperature in sublimation of iodine when quenching with cold entrainer is used.

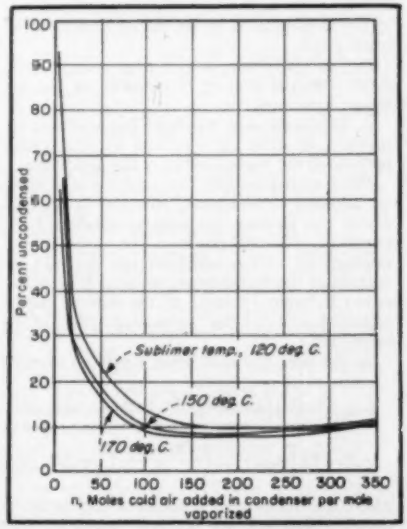


Fig. 10—How percent of iodine uncondensed varies with sublimer temperature and cold entrainer used for quenching, assuming negligible external cooling.

Without external cooling

We shall first calculate the percent uncondensed in the case of no external cooling, where the amounts of entrainer added in the sublimer and condenser are the minimum amounts given by Eqs. (9) and (10). Using as a basis 1 mole vaporized and a datum temperature T_o, we have this heat balance around the condenser:

$$\left(\frac{P_s}{760-P_s}\right)\left(\frac{760-P_{TP}}{P_{TP}}\right)\Delta H + c_{ent.}\left(\frac{760}{P_{TP}}-\frac{760}{P_s}\right)(T_s-t) = c_{ent.}\left(\frac{760-P_s}{P_s}\right)(T_s-T_o) + c_{sup.}(T_s-T_o)+\Delta H \quad (14)$$

After solving Eq. (14) by trial and error for the condenser temperature T_s, the percent uncondensed is calculated from Eq. (13). The calculation of condenser temperature involves the assumption of a value of T_s, reading the corresponding value of P_s from the vapor pressure curve, and seeing if a check is obtained when these values are substituted into Eq. (14). Such calculations have been performed for iodine, assuming air as the entrainer, with a cold air temperature of 20 deg. C. The results are plotted in Fig. 9. It will be observed that in this case the percent uncondensed is minimized by operating the sublimer at elevated temperatures in the neighborhood of the normal boiling point. It is also clear that if no external cooling is available, the amount uncondensed is so great as to make the process impractical unless the entrainer is recirculated. The situation may be different for other substances—depending on the specific heat, latent heat of sublimation, and vapor pressure of the substance being sublimed.

The conclusions to be drawn from Fig. 9, therefore, are as follows: If the partial pressure in the condenser is to be reduced only to the triple point:

1. Recoveries may be very poor unless considerable external cooling is available or the entrainer is recirculated.

With excess cold entrainer

2. Relatively high sublimer temperatures are required in order to condense an appreciable portion of the vapors entering the condenser.

We now inquire into the question of whether the addition of excess cold entrainer in the condenser can increase the amount condensed, by providing additional cooling. The obvious disadvantages of adding additional air are (1) reduction in the temperature required for condensation to begin (because of the reduced partial pressure), and (2) the "entraining" effect of the excess air.

In this case, the heat balance may be written:

$$\left(\frac{P_s}{760-P_s}\right)\left(n+\frac{760-P_s}{P_s}\right)\Delta H + c_{ent.}\,n(T_s-t) = (T_s-T_o)\left[c_{sup.}+c_{ent.}\left(\frac{760-P_s}{P_s}\right)\right]+\Delta H \quad (15)$$

where n is the number of moles of cold entrainer added in the condenser per mole vaporized. After the condenser temperature and pressure are calculated by trial and error from this equation, the percent uncondensed is calculated as

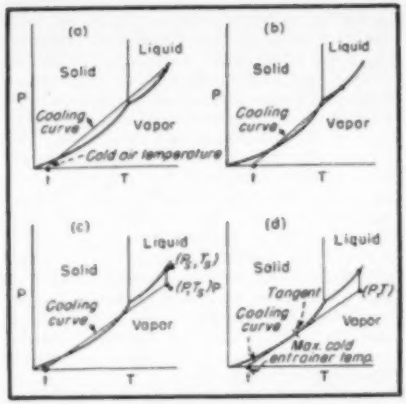


Fig. 11—How cooling path affects results secured by quenching: (a) Sintering occurs; (b) no sintering occurs; (c) diluting still vapors with excess hot entrainer avoids sintering; (d) tangent fixes the maximum cold entrainer temperature for condensation.

$$\%\ \text{uncondensed} = \left(\frac{P_s}{760-P_s}\right)\times\left(n+\frac{760-P_s}{P_s}\right)\times 100 \quad (16)$$

The results for the sublimation of iodine, with air at 20 deg. C. as the quenching medium, are given in Fig. 10 for several sublimer temperatures. It will be observed that for any given sublimer temperature an optimum exists in the amount of cold entrainer added in the condenser. If 100 or more moles of cold air are added per mole of vapor, recoveries exceeding 90 percent can be obtained without external cooling. When this ratio reaches several thousand, however, recoveries drop off to negligible values, because of the entraining effect of the excess air. Then, for this system:

We may conclude:

1. Quenching ratios of several hundred may be required in order to obtain good recoveries, if external cooling is ineffective.

2. Quenching ratios below 25 or above 1,000 give poor recoveries. It is unsafe to add the minimum amount of cold entrainer required to bring the partial pressure down to the triple point, unless ample external cooling is available.

3. In no case can recoveries better than about 93 percent be obtained in the absence of external cooling.

4. There is a relatively slight advantage in using high sublimer temperatures.

Control is needed

While it is unsafe to generalize these conclusions to other systems, it is apparent that (1) An uncontrolled sublimation process (i.e., one in which entrainer ratios are not kept in the proper range) will give poor recoveries, and that (2) high recoveries cannot generally be expected without external cooling or recirculation of the entrainer. The principal reason for this is that the cooling medium also acts as an entrainer in the condenser. This can be avoided if the entrainer can be condensed (e.g., steam), so that the amount of entrainer which is actually ejected to the atmosphere is small.

Condensation as a liquid

In entrainer sublimation above the triple point, condensation may sometimes occur first as a liquid. This may be illustrated by means of the following heat balance equation:

$$\left(\frac{760}{p}\right)(T-t)-\left(\frac{760}{P_s}\right)(T_s-t)+(T_s-T)$$

$$=\frac{c_{vap.}}{c_{mix.}}(T_s-T) \qquad (17)$$

This equation applies to the process of mixing cold air and cooling in the condenser, and is applicable down to the point where condensation just begins. The condensation temperature can be calculated from this "cooling curve" equation by trial and error, since at this temperature p is a point on the vapor pressure curve corresponding to the temperature T. If the slope of the (p-T) line calculated from Eq. (17) at the still temperature is less than the slope of the vapor pressure curve, the initial condensation (until the triple point is attained) will be as liquid. The slope of the cooling curve is

$$\frac{dp}{dT}=\frac{p+\left(\frac{c_{vap.}}{c_{mix.}}-1\right)(p^2/760)}{(T-t)} \qquad (18)$$

If the pressure is low, or if $c_{vap.}/c_{mix.} = 1$, Eq. (18) becomes approximately

$$\frac{dp}{dT}=\frac{p}{T-t} \qquad (19)$$

The slope of the cooling curve according to Eq. (19) is shown graphically in Fig. 11. It will be found that for $t = 20$ deg. C., the initial solidification in the case of iodine is always as liquid—assuming the air leaving the still is saturated with iodine vapors. When the first part of the solidification occurs as liquid (as in this case), the final product is said to be sintered since many of the snow-like particles are aggregated by the liquid. Ultimately, of course, the entire product is solidified, but its snow-like appearance is impaired.

To avoid sintering, dilute . . .

In order to avoid sintering of the product, it is often necessary to have some dilution of the still vapors with hot air before the cold air is admitted in the condenser. Thus, as shown in Fig. 11 (c), if the still vapors (assumed to be saturated) are diluted with hot air at the same temperature as the still, sintering can be avoided. It will be observed that it is not necessary to reduce the partial pressure (by dilution with hot air) to a value below the triple-point pressure. However, if this is done, sintering is obviously made impossible, and the situation becomes less critical in so far as the cold air temperature is concerned.

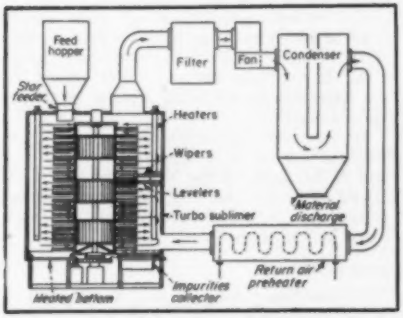


Fig. 12—Turbo sublimer (Wyssmont Co.) is the only equipment regularly offered for entrainer sublimation.

Because of the possibility of avoiding sintering by dilution of the still vapors with hot entrainer, it is not always disadvantageous to have a comparatively low relative saturation in the still. However, it will be preferable to have a high relative saturation and then dilute the still vapors with a controlled amount of hot entrainer, by blowing it into the vapor space of the still. In this way, maximum productivity and control of the process are attained.

It is evident from Fig. 11 (*d*) that for any given condition of the still vapors prior to quenching (whether saturated or diluted), there is a maximum cold entrainer temperature beyond which no condensation will occur. This temperature is located (approximately) by drawing a line tangent to the vapor pressure curve. Where this line intersects the temperature axis, the maximum cold entrainer temperature is read.

. . . But not too much

It is apparent, therefore, that while it may be desirable to dilute the still vapor with a small amount of hot entrainer, it is undesirable to add too much hot entrainer, since this may reduce the required cold entrainer temperature to an unreasonably low value. The safest course, therefore, is to limit the dilution to the smallest amount necessary to avoid sintering—provided sintering is regarded as objectionable. If the appearance of the product is not important, the still vapors should not be diluted with hot entrainer at all, but should be cooled by all available means, including external cooling.

At this point we should examine some of the actual equipment types. There are, in general, two main classifications which can be described as (1) the "dryer" type; and (2) the "distillation" type.

Actual equipment types

1. In the dryer type the material in the sublimer is in the solid state and the problems of getting heat into it and removing vapor from it are similar to those in drying operations. Thus, it is essential to have either thin layers of material, or agitation, or both. Tray type dryers or sublimers provide for thin layers, while agitated pan dryers and equipment similar to rotary dryers provide for agitation. The Turbo dryer, modified for sublimation as in Fig. 12, combines both features since it uses trays which rotate and discharge the solids from one set of trays to the next by gravity, in a manner somewhat similar to multiple hearth roasters. In this type the heat is provided by internal reheating of the entrainer which in turn heats the material. Turbo sublimers operate in a closed entrainer circuit, with or without an external preheater for the recirculated entrainer.

Tray and pan type sublimers of most kinds are inherently batch units, while the rotary and Turbo types are suitable for continuous operation. The Turbo type is always operated with an entrainer but the others mentioned can ordinarily perform either simple (usually vacuum)

sublimation, or entrainer sublimation. For simple sublimation the equipment is essentially the same as that used in vacuum drying; in entrainer sublimation it resembles that for air drying. In any event, it should be kept in mind that the absence of a liquid phase in sublimation means a somewhat poorer heat transfer coefficient than in drying, so that agitation is usually desirable.

Kettle type sublimer

2. In the distillation or "kettle" type of sublimer a liquid phase is present, with or without additional solid phase. The liquid may actually be molten material, in which case the vaporization step is actually conventional distillation. Operation in this way is possible, as already noted, when the melting point has been reduced by impurities, so that the sublimer temperature only slightly exceeds the melting point of the pure material; or where quenching is used in the condenser. On the other hand, the liquid may be an added heat transfer medium of relatively low vapor pressure, so that it will not volatilize to an appreciable extent. In other cases this "flux" is one that is appreciably volatile, but is easily separated from the sublimate. Distillation type equipment in which the feed material is suspended in a "flux" requires agitation. Generally, higher heat transfer coefficients can be obtained in the distillation type sublimer than in the dryer type, so that the equipment can be smaller. Offsetting this advantage may be the need for higher sublimer temperature, or the presence of an added impurity in the product which may require further purification.

Condenser designs still lag

There has been much more progress in the last two decades in subliming equipment than in the corresponding condensers. Equipment manufacturers have made few attempts to develop optimum designs for condensing vapors to solids. Mostly, condensers are very large, simple, homemade affairs with no effort made to control condensation, keep heat transfer surfaces clean, or simplify product collection so as to minimize labor needs. Heat transfer coefficients as low as ¼ to 1½ Btu./(hr., sq. ft., deg. F.) are usual. These poor rates can be attributed to three causes: low gas velocities within the necessarily large chambers; cooling usually by external air, employing natural convection; and finally the insulating effect of the solids which collect on the inner surfaces of the condenser. Ordinarily a separate particle separator is not used so that low velocities are needed, and hence large chambers. However, with separate particle separators or recycling, extremely low velocities are not needed, which results in some improvement. Additional cooling through quenching is limited in utility, although it may be advantageous if recycling is used. External water cooling ordinarily is not feasible since it tends to produce an icy deposit on the walls.

Brushing improves results

One useful method of improving condensers lies in the use of scrapers or brushes to remove the solids continuously from the walls. Fig. 13 shows the installation plan for a Turbo sublimer plant, with entrainer recirculation, in which means are provided for sweeping the condenser walls and discharging the solids. Earlier attempts along these lines appear in the literature, for example, those of the Selden patents.[3]

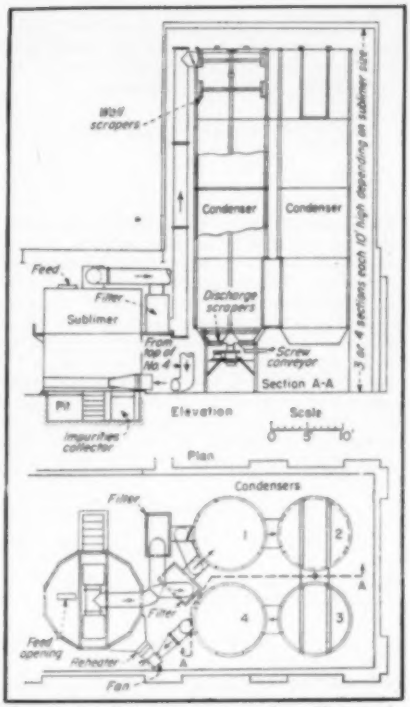


Fig. 13—Installation layout for a large Turbo sublimer, showing condenser-wall sweeping device.

The arrangement of condensers, whether in series or in parallel, depends on whether the condensed product is to be graded by crystal size, or whether preferential condensation is desired.

Still to be done

There is considerable work still to be done in condensers for sublimation. For example, the effect of introducing cold air into the condenser, on the character of the solids formed, still lacks sufficient investigation to yield methods that will give predictable results. It is not to be anticipated that very small condensers will ever prove practical, since it takes time to grow crystals of the right size. However, improvements will come. But it is recognized that the problem of crystal or lattice formation and grain growth must be added to the problems of heat transfer, which tends further to limit condenser design.

As its principles become better known, we can expect to see a marked increase in the use of sublimation.

In conclusion the author acknowledges gratefully the interest of Messrs. Arnold Weisselberg and A. M. Lane, of the Wyssmont Co., Long Island City, who read the manuscript, supplied certain information and illustrations, and made many helpful suggestions.

REFERENCES

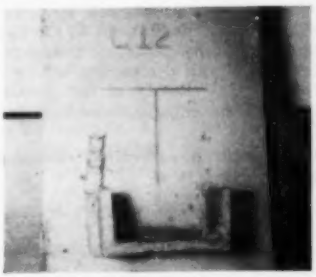
1. Bebie, Jules, *Chem. Met. Eng.*, **41**, 247 (1934).
2. Vernon, H. C., in Perry's "Chemical Engineers' Handbook," 3rd Ed., p. 660-5, McGraw-Hill Book Co., New York, 1950.
3. Wilke, C. R., *Chem. Ind.*, **63**, 34 (July 1948).

More About Protecting Your Steel

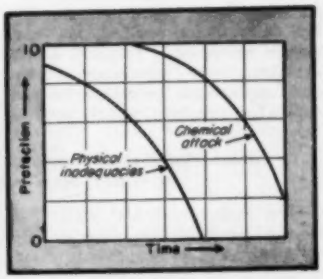
Coating consultant adds benefits of his experience to thought-provoking April article "How to Protect Your Steel"—describing novel approaches to the problem.

NOTE: *Interest ran high enough in the April 1951 article in Chemical Engineering to warrant adding these comments to some of the points brought out by author J. B. Scott, chief engineer for Phillips Chemical at Pasadena, Tex. Reviewer is Kenneth Tator of Kenneth Tator Associates, Coraopolis, Pa.*

The April article described what Phillips has found out about protecting their steel structures from a combination of severe atmospheric and chemical attack. Novel approaches to the problem emerged from the thorough and intelligent survey made. Some Mr. Tator endorses and elaborates on—others he takes issue with.—EDITOR



Commenting on the value of conventional test panels, Tator suggests instead a standard test panel such as the one above that reproduces all the common structural steel irregularities.



He also goes further into Scott's recognition of the importance of physical inadequacies of the paint film as compared with its chemical resistance, giving results of several hundred observations.

REGARDING TEST PANELS—

Scott: "We have little use for the conventional variety—prefer angle iron sections."

In an effort to evaluate as many of the more promising protective coating materials and methods as possible, a small-scale testing program has been established. This program is strictly practical in nature, attempting to duplicate on a small scale the conditions of surface preparation and application that are encountered in the plant on a large scale.

The preparation and exposure of test panels has been eliminated entirely. Panels usually get better surface preparation than any plant structures, and they do not have the comparable type of thin edges and sharp corners. Many materials showing good durability on panel exposure tests fail rapidly when used under more realistic conditions.

In contrast, short sections of angle iron more nearly duplicate plant structural shapes and are more easily given similar surface preparation and coating. Prepared sections using methods and materials to be evaluated can be fastened to equipment or structures and exposed to the desired conditions, along with sections duplicating applications of known durability for comparison. However, at best such comparisons serve only as a screening process to eliminate the more unsuitable materials and procedures. Final evaluation can be made only after actual application over a reasonable area in the plant. Then actual performance can definitely be determined.

Tator: "Conventional test panels are only good for testing the coating material itself. Suggest panel that reproduces all the common structural irregularities."

Conventional test panels and specimens of the flat plate or rod variety with carefully rounded edges are certainly of no use in predicting coating performance for protection of equipment and structures under use conditions. Such specimens were never intended for such purposes and are actually misleading if so used. They are designed and properly used only to evaluate the resistance of the coating material, as a material, to the test environment. As such, conventional test panels are valuable tools of the material formulator.

Mr. Scott very justly points out that such specimens fail to differentiate the ability of various coatings to maintain adequate protective thicknesses over the many types of irregularities normally encountered on and in the surfaces of plant equipment and structures, such as welds, projections, pits, crevices, sharp edges, and moisture and soilage pockets in addition to plane surfaces. The latter alone are represented on material test panels. Mr. Scott fully recognizes this distinction in his article, and in fact instead of condemning all panel testing actually has standardized upon angle iron specimens which incorporate planes, edges and inside corners.

Above is a standardized and reproducible test panel used extensively by the reviewer for industrial corrosion surveys and evaluations. This panel successfully reproduces all common structural irregularities and correlates well with plant performances. In the use of such performance panels it should be cautioned that intelligent interpretation of the results is required with the end use constantly in mind. For example complete protection of structural steel catwalks will require substantially equal weighting for all points of early failure reproduced on the panel, whereas the protection of a new welded cylindrical vessel requires predominate weight to be given to plane areas, considerably lesser weight to weld areas, and little or no weight given to other points of early failure. This panel and its use will be discussed in detail in a paper now in preparation.

REGARDING THE RELATIVE IMPORTANCE OF PHYSICAL INADEQUACIES OF THE PROTECTIVE PAINT FILM AND ITS CHEMICAL RESISTANCE—

Scott: "Porosity is more important than chemical resistance to the success or failure of the applied paint film."

At the inception of the protective coating program at Pasadena, it was thought that the chemical resistance of the coating film itself was the most important factor in the success or failure of a coating material once the surface was properly prepared. Later, experience derived from relatively large scale applications on equipment and supporting structures proved that this factor was a secondary one. Of more importance was the porosity of the applied film.

The rapidity of failure of applied films of the same materials appeared to be roughly proportional to the degree of porosity. Materials with good inherent chemical resistance but having a higher porosity of the applied film gave poorer performance than materials of lesser resistance but with a greater degree of impermeability. It was found necessary to use total film thickness as a criterion of proper application rather than merely the number of coats without consideration for the solids content of the coating material or the personal factor in application technique. (See below for further discussion of film thickness).

Tator: "Imperfect wetting, inadequate penetration, and high surface tension cause a film to fail faster than chemical attack."

We find, as did Mr. Scott, that failure may occur from either or both of two causes: (1) physical inadequacies of the liquid coating and (2) lack of inertness of the dry film to the chemical exposure. Visible failure due to the first cause occurs quite rapidly and is determined only by the rate of attack of the environment on the base metal, whereas the latter proceeds more slowly, the rate determined also by the permeability to or the rate of degradation of the film by the chemical environment. The failure pattern of each of these two types is characteristic and recognizable. Typical protection-time trends for each type as recorded by several hundred observations by the reviewer's organization are shown in the plot on the preceding page.

The first type of failure, physical inadequacies of the liquid coating, is the result of imperfect wetting of the base steel surface, inadequate penetration of the coating into crevices, or a high surface tension causing the applied liquid coating to flow away from the peaks of projections, edges, and rough welds. These deficiencies result in points where the base metal is protected by no or insufficient coating, as can be verified by examinations with an electrical continuity tester. This type of failure is quite common to the synthetics which dry solely by evaporation of the solvent. Paints containing appreciable quantities of drying oils such as raw linseed or fish oil best resist failure by this mechanism. Newer developments in priming techniques for the synthetics may improve the performance of these.

The second cause of failure through film permeability to or film degradation by chemical agents, varies considerably with the type of exposure and the nature of the paint film but in general is best resisted by the synthetics. The drying oil types are most susceptible to this failure.

Test panels designed for evaluating material resistances of the flat plate or rod types primarily disclose failure of the second type and give no indication of the tendency of a coating to fail by the first cause.

REGARDING THE USE OF BASICALLY DIFFERENT MATERIALS FOR SUCCESSIVE COATS—

Scott: "Unorthodox combinations failed rapidly in our tests."

Many different types of coating materials have been tried, both singly and in combination. Unorthodox combinations, using basically different materials for successive coats, failed rapidly in all applications.

Tator: "Certain composite systems have been successfully applied."

In developing a paint protection system for any industrial chemical exposure in which failure by both physical inadequacies and chemical attack will be of significance, consideration of nonhomogeneous systems invariably arise. A metal prime based on drying oils possessing wettability and penetration covered with the chemical resistant synthetics theoretically will be the ideal system. However, as Mr. Scott points out, such fail more often than not through incompatibilities of the two basic materials, evidenced by poor intercoat adhesion or lifting of the undercoats. Such compromise coatings can be successfully developed by intelligent selection as evidenced by the composite system developed by C. C. Harvey and in successful use at the Ethyl Corp. plant at Baton Rouge.[3] In the course of chemical maintenance improvements conducted by the reviewer's firm other such composite systems have demonstrated adequate performance.

REGARDING THICKNESS OF COATING—

Scott: "Thicknesses below the optimum mean disproportionate decrease in durability, above—no payout."

As mentioned above, total film thickness should be used as a criterion of proper application rather than merely the number of coats without consideration for the solids content of the coating material or the personal factor in application technique.

Optimum film thickness naturally varies with the material being used. This thickness has been found to be 5-6 mils for vinyl phenolic and alkyd coatings, and 60-75 mils for the gilsonite-asphalt mastic. For the vinyl mastic currently being evaluated, 30-35 mils thickness seems to be satisfactory. Thicknesses below these optimum values apparently are responsible for a disproportionate decrease in durability, while film thicknesses in excess of those given have not shown so far an economic payout in increased life.

Tator: "Agree. Do not rely on the number of coats to give you desired thickness—check it."

As Mr. Scott points out a most important method of minimizing failure is to maintain minimum thickness standards. This negates physical coating inadequacies by sealing across crevices and pits and piling material over edges and projections by sheer coating bulk. It sounds crude when stated this way, but is highly effective! G. H. Young has demonstrated that there is a minimum threshold coating thickness to attain film continuity which may be as high as 1 mil for specific coatings and base metals.[3]

Studies by the reviewer's organization in collaboration with one of the leading chlorine-alkali producers indicate that a total system thickness of five mils or greater on plane surfaces of steel is required to insure above-threshold thicknesses over peaks, projections and edges. While this limit will vary slightly with coating types and appreciably with equipment design and surface preparation, it may be taken as a safe minimum thickness for chemical maintenance painting. This work is the subject of a paper now in preparation, and confirms the findings by Mr. Scott. The break in coating performance below 5 mils thickness is so sharply defined that thickness determinations rather than number of coats should always be the determinant of coating sufficiency. Such thickness measurements in the plant have in the past been awkward to obtain but the present availability of pocket magnetic gages now make this quite a simple routine determination.

For plant maintenance protection it becomes expensive and cumbersome to require greater than a three coat system and intercoat contamination is a problem even with this number. To meet the required 5-mil total thickness with a 3-coat system requires a paint capable of yielding almost 2 mils per coat. Very few oleo-resinous and practically no synthetic coatings meet this requirement.

Owing to lack of appreciation of these standards, practical difficulties in readily finding materials to meet them, and premature paint failure caused by their disregard, many chemical plants have resignedly but unnecessarily contented themselves with a six month repainting schedule.

With intelligent evaluation and study such as had been done by Mr. Scott, C. C. Harvey[4], and O. K. Sieplein[5] paint life may be extended to over 3 yrs. In an industrial operation of any magnitude this decrease of more than 80 percent of current maintenance painting costs will more than justify the effort.

REGARDING SURFACE PREPARATION

Scott: "Sandblasting is best. Hand cleaning should be followed by acid treatment."

It has often been said that proper surface preparation is responsible for at least half the success of a coating system. With this in mind, many methods of surface preparation were tried to determine how far it is necessary to go.

Dry sandblasting, although relatively expensive, was most satisfactory. Generally, to minimize chemical contamination, specifications now require that all blasting be done on the day shift and on a dry day, cleaning only that area that can be coated in the same shift.

In areas where sandblasting is prohibited, the most effective method is thorough hand cleaning followed by treatment with solutions containing phosphoric acid or a mixture of phosphoric and sulphuric acids. As before, the cleaned and treated areas must be coated during the same shift. This hand cleaning and chemical treatment is not as satisfactory as sandblasting, but appears to be the next best substitute.

Tator: "Agree sandblasting is best. But maintenance men are reluctant to use it—and it is hazardous in some areas. Special primers needed after hand cleaning."

The tendency of a coating to fail can be reduced by effective surface preparation. Sandblasting has demonstrated its superiority and when it becomes accepted practice to keep accurate paint performance cost records this initially expensive method may prove to be the means of realizing the greatest savings in plant maintenance costs through longer paint life.

However, maintenance management is reluctant to adopt blasting as the standard means of surface preparations. Contamination and safety hazards from the dust and sparks of blast operations also preclude its use in many manufacturing operations. A primer material of excellent wetting and penetrating characteristics must be used to offset the less-effective but permissible hand-cleaning.

REGARDING POLICY OF USING CHEAP SURFACE PREPARATIONS AND CHEAP COATINGS

Scott: "Although doubtful, this policy might be more economical than sandblasting and using more resistant coatings which would be applied less frequently."

Because of the severe conditions and relatively poor service obtained so far from even the best coatings used, work to determine the merit of the following proposal is underway. (Steel structures at the Adams Terminal Plant of the Phillips Chemical Co., Pasadena, Tex., are subject to salt air, high average temperatures, high humidity and fumes and dusts associated with the manufacture of ammonium sulphate from anhydrous ammonia and sulphuric acid). It will be interesting to examine the results when the evaluation has been completed.

The idea is that sandblasting should not be used and that surface preparation be limited to the best cleaning possible by hand methods. In addition, relatively low-cost coatings should be used. Dark-colored house paints and pigmented asphaltums are among those suggested. The thinking behind this proposal is that while sand-blasting and the more resistant coatings admittedly will give longer service per application, the use of poorer preparation and materials will cost so much less per application that the annual cost of satisfactory protection will be reduced despite the increased number of applications required. This proposal is a radical departure from the doctrine built up by the experiences of protective coating manufacturers and consumers over many years. This idea was advanced by one of the largest manufacturers of protective coatings in the country.

Tator: "Don't you believe it!"

This proposal, reported by Mr. Scott but new to the reviewer, is to use the cheapest form of surface preparation and the cheapest paint. It is claimed that the money so saved will more than pay for the greater frequency of applications required. Under typical chemical atmospheric exposures such a procedure would start to show failure immediately after application.

Assuming a generous service life to repainting of 3 mo. for such a system, a realistic 6 mo. for a casually selected coating of good quality with a usual wire brush surface preparation, and a conservative 2 yr. for a properly designed system with good surface preparation, the following costs will speak for themselves. (Remember that if a painter and helper today spends 1 minute on 1 sq. ft. of surface—5 c. of direct labor is charged to that area!)

Cost comparison

	Cents per sq. ft. (3 coats) Cheap Material, Casual Cleaning	Standard Material, Wire Brush	Proper Material, Sand-blast
Surface preparation	2.5	7.5	15.0
Material cost	1.5	4.0	4.5
Painting labor	7.5	7.5	7.5
Scaffolding, misc.	.5	.5	.5
Total direct cost	12.0	19.5	27.5
Cost/sq. ft./yr.	48.0	39.0	13.8

REGARDING NO-PROTECTION POLICY

Scott: "Used in some plants for many years, this policy has less merit now that steel is becoming costlier and harder to get."

We have considered this proposal: that no effort should be made to protect the steelwork in the more corrosive areas, and that such steel be replaced as required. This is not wholly a new idea. It has been the accepted practice in certain plants for many years, notably in the coke-oven byproduct recovery areas of some of the larger steel plants. In view of the steadily increased cost of steel and labor, however, this proposal has less economic merit now than in the past. The decreasing availability of steel at the present time due to diversion to military uses is another unfavorable factor tending to discredit this proposal.

Tator: "Important safety and housekeeping considerations make the no-protection still less attractive."

Rather than repaint on a six-month schedule, Mr. Scott points out management often proposes that no painting be done and steel replaced as it corrodes out. The serious proposal of a suggestion of this type illustrates managerial acquiescence to high chemical plant maintenance costs and ignorance of the rewards possible through improvement programs. Such a no-protection-policy has proven disastrous for steel of loadbearing structural members and process equipment. The cost of regular inspections to determine when remaining metal thicknesses no longer exceeds the safe load limits will more than take care of an adequate protection program. Furthermore the attitude of a workman toward his job is set by the appearance and condition of his surroundings!

REFERENCES

1. C. C. Harvey, "Selection of Protective Coatings for Chemical Fume Resistance," *Corrosion* **6**, No. 10, 323-6 (Oct. 1950).
2. G. H. Young and G. W. Gerhardt, "Film-continuity of Synthetic Resin Coatings," *Ind. Eng. Chem.* **29**, No. 11, 1277-80 (Nov. 1937).
3. O. K. Sieplein, "Dow Draws Conclusions from Three-Year Paint Study," *Chem. Eng.*, Oct. 1950, p. 110-5.

Nomograph for Gaseous Systems

Diffusion coefficients now determined without solving messy Gilliland equation.

C. D. SPANGENBERG, JR.

The use of a nomograph to estimate diffusion coefficients of gaseous systems makes it unnecessary to handle the cumbersome Gilliland equation[1]

$$D = B \frac{T^{3/2}}{P\left(v_A^{1/3} + v_B^{1/3}\right)^2} \sqrt{\frac{1}{M_A} + \frac{1}{M_B}}$$

The term

$$\frac{\sqrt{\frac{1}{M_A} + \frac{1}{M_B}}}{\left(v_A^{1/3} + v_B^{1/3}\right)^2}$$

is a constant for a given system, therefore the equation reduces to

$$D = kBT^{3/2}/P$$

which is ideal for incorporation into a nomograph.

MR. SPANGENBERG, *B.Ch.E. Virginia '51, is now with Calco Chemical.*

The molecular volumes used in calculating k are those given by Arnold.[2] If values of k are desired for systems other than those given in the accompanying table, they may be calculated from readily available values of atomic and molecular volumes.[3]

The plot was made for a wide range of conditions, −20 to 500 deg. C. and 0.1 to 100 atm, thus giving a correspondingly wide range of coefficients. It should be carefully noted, however, that the data upon which the equation is based cover only a narrow range, 0 to 100 deg. C. and 1 atm. Extreme temperatures and pressures may give wide deviations from actual values, but the intended use of the nomograph as a means of rapid estimation warranted their inclusion.

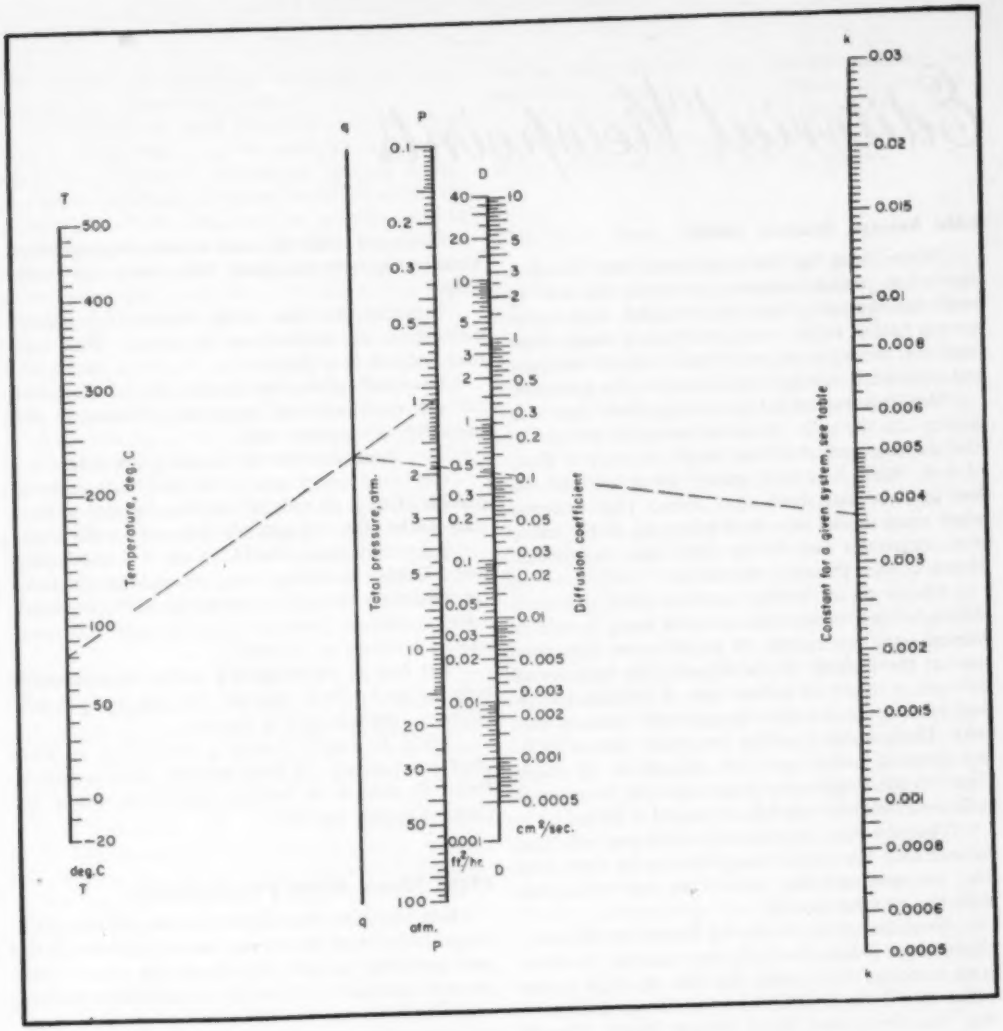
NOMENCLATURE

- D = diffusion coefficient, cm.²/sec. when $B = 0.0043$ ft.²/hr. when $B = 0.0166$
- B = Gilliland constant
- T = temperature, deg. K.
- P = total pressure, atm.
- V_A, V_B = molecular volumes of components at their normal boiling points, cm.³/g.-mole
- M_A, M_B = molecular weights of components
- k = constant for given system

A sample of the use of this nomograph is as follows: What is the diffusion coefficient for benzene diffusing into air at 80 deg. C. and 1 atm? To solve, connect 80 on the T scale with 1 on the P scale. Then connect the intersection of this line with the q line with 0.00369 (read from the table for a benzene-air system) on the k scale, and read 0.11 cm.²/sec. or 0.42 ft.²/hr. on the D scale.

REFERENCES

1. Gilliland, E. R., *Ind. Eng. Chem.*, **26**, 681 (1934).
2. Arnold, J. H., *Ind. Eng. Chem.*, **22**, 1091 (1930).
3. Perry, J. H., Chemical Engineers' Handbook, 3rd ed., p. 528, McGraw-Hill Book Co., 1950.



Values of K for Use with Diffusion Coefficient Nomograph

System	k
Methane with . . .	
Ethane	0.00665
Propane	0.00549
Butane	0.00479
Pentane	0.00432
Hexane	0.00396
Ethylene	0.00711
Propylene	0.00577
Ethane with . . .	
Propane	0.00376
Butane	0.00326
Pentane	0.00292
Hexane	0.00266
Ethylene	0.00497
Propylene	0.00395
Propane with . . .	
Butane	0.00259
Pentane	0.00231
Hexane	0.00209
Ethylene	0.00404
Propylene	0.00317
Butane with . . .	
Pentane	0.00196
Hexane	0.00177
Ethylene	0.00348
Propylene	0.00272
Benzene with . . .	
Toluene	0.00171
Methane	0.00467
Ethane	0.00312
Propane	0.00245
Butane	0.00207
Hexane	0.00163
Nitrogen with . . .	
NH_3	0.00825
Methane	0.00805
Carbon dioxide with . . .	
CO	0.00595
N_2	0.00591
H_2	0.0225
Cl_2	0.00405
O_2	0.00607
Methane	0.00728
Ethane	0.00486
Hydrogen with . . .	
N_2	0.0236
NH_3	0.0258
Methane	0.0246
Ethane	0.0194
Propane	0.0165
Butane	0.0147
Ethylene	0.0206
Propylene	0.0173
Oxygen with . . .	
H_2	0.0254
N_2	0.00696
SO_2	0.00515
SO_3	0.00441
NH_3	0.00865
Water vapor with . . .	
CO	0.00901
CO_2	0.00804
N_2O	0.00784
NO	0.00973
NO_2	0.00782
HCl	0.00885
SO_2	0.00695
SO_3	0.00597
NH_3	0.0168
H_2	0.0289
O_2	0.00939
N_2	0.00806
Cl_2	0.00665
Acetone	0.00571
Benzene	0.00500
Toluene	0.00450
Ethyl ether	0.00478
Acetic acid	0.00595
Methanol	0.00785
Ethanol	0.00629
Methane	0.0104
Ethane	0.00731
Propane	0.00593
Butane	0.00515
Air with . . .	
Water vapor	0.00901
CO	0.00583
CO_2	0.00596
N_2O	0.00581
NO	0.00729
NO_2	0.00678
HCl	0.00660
SO_2	0.00509
SO_3	0.00437
NH_3	0.00835
H_2	0.0240
O_2	0.00701
N_2	0.00678
Cl_2	0.00455
Acetone	0.00426
Benzene	0.00369
Toluene	0.00332
Ethyl ether	0.00355
Acetic acid	0.00441
Methanol	0.00594
Ethanol	0.00472
Methane	0.00811
Ethane	0.00558
Propane	0.00449
Butane	0.00385
Pentane	0.00344
Hexane	0.00312
Sulphur dioxide with . . .	
NO	0.00537
NO_2	0.00413

Editorial Viewpoints

Idle Scrap, Scarce Steel

We're losing the battle for scrap. And this at a time when process industries are crying for steel to build vital defense plants, when stainless steel equipment is hardest to get, when steel pipe is scarce, when there aren't enough tank cars to move critical chemicals, and when steel cylinders and drums are at a premium.

Steel furnaces are eating up scrap faster than it is coming into the mills. Stocks at most mills have dwindled from a normal 60-day supply to only a third of that. Many have only enough for a few days. A few furnaces have been shut down. Last summer, when scrap should have been piling up at the mills, steel companies had to dip into their inventories. Hence a crisis threatens this winter.

There's no use kidding ourselves about this scrap shortage. Steel makers are currently using 3 million tons of scrap per month—50 percent more than they used at the peak of World War II. To keep up at this rate, a record 36 million tons of purchased scrap will have to be fed into hungry steel furnaces this year. That's nearly 7 million tons more than in 1950, the previous record year. It's enough to fill more than 700,000 freight cars. And to get this scrap, steel mills and foundries will have to pay $1.5 billion.

This new high requirement means you will have to send back five tons of scrap this year for every four tons you sent back last year—if you are to keep up with the national average.

Steel executives, headed by Robert W. Wolcott, chairman of Lukens Steel Co. are directing a nationwide campaign to increase the flow of scrap to the mills. W. T. Hoyt, director of the salvage division of the War Production Board during World War II and recently a special consultant for NPA on scrap and salvage, is executive secretary of this steel industry scrap mobilization committee.

Goal of the drive is to get 8 million tons of dormant scrap. Wolcott estimates the nation's industrial plants can turn in 2 million to 3 million tons.

A force of 2,000 scrap sleuths from the nation's steel companies will visit industrial plants to ferret out old and idle machinery. They will try to reach at least 90 percent of the steel users in the U.S.

This call is not for school kids and housewives to turn in bird cages and bobby pins. It's a call to you in industry to turn in heavy scrap. And that means wornout machinery and obsolete equipment lying around in your plants and yards. This shouldn't be hard for the chemical industry which prides itself on being "always building, never built."

Cooperate with the steel industry representative when he comes to your plant. Help him to get in the scrap.

Organize your own scrap sleuths. Give them authority to decide what can be junked. Then turn them loose in your plants.

Fine-comb plants for dormant scrap. Root out the old machinery and equipment. Dismantle old units that will produce scrap.

Set a target date for the job and get it done.

Get scrap on its way to the mills as quickly as possible. Get it all collected and turn it over to your scrap dealer. Don't forget, you get paid for this scrap.

Scrap collections should be on a housekeeping basis. Besides recovering scrap, you may benefit from tax reductions through inventory writeoffs, improved safety conditions, lowered insurance rates and more space for storage or production.

But best of all, by getting in the scrap you will help the steel mills to turn out the steel that you and others so urgently need at present.

You'd be surprised what a scrap drive in your plant can turn up. In three months, Eastman-Kodak found 88 carloads of dormant scrap lying around its plants. Can you top that?

Fight Marx With Proliferation

Karl Marx first formulated the principle of capital accumulation—that the success of one business enterprise inevitably restricts opportunity for others. He pictured capitalism as essentially cannibalistic: the big ones always eat up the little ones to produce more and more gigantic monopolies. The economic history of the United States in the hundred years since Marx made this statement has proved that he was hopelessly wrong. But it is only recently that our economists have formulated an opposing principle to explain why the dynamics of free democratic capitalism generally moved in the reverse direction.

Alderson and Sessions, marketing and management counsel of Philadelphia, have stated what they call the "principle of proliferation" as follows: "The success of a firm or a type of firm tends to create opportunity for its simulant, its deviant, and its complement." By way of further definition, the authors explain that a simulant is a new firm that tries as nearly as possible to simulate the operations of the successful firm. The deviant deliberately departs from the pattern set by the successful firm, although still serving an essentially similar purpose. A complement is a new enterprise

that engages in a related and complementary rather than directly competitive activity.

The history of most successful chemical enterprises is replete with persuasive examples of the workings of this principle of proliferation. It finds application within individual companies as well as within the industry as a whole. Much of our research could be classed as simulant or deviant activities. But chemical industry has grown most because of the opportunity for complementary enterprises. The end uses of basic chemical products ramify in many directions. To follow those that complement rather than compete directly with one's own endeavors is good business for all concerned. Thus the success of the larger enterprises promotes the success of smaller companies who are their customers. And none can grow so large or so powerful that it does not invite competition from those who would simulate its success.

The principle of proliferation of opportunity is indeed better than the Marxian principle of capital accumulation. So long as American industry is permitted the freedom to operate under it there will be no restriction on opportunity to grow and develop.

Wanted: 60,000 Freshmen

What happens this month in our engineering colleges and universities will have lasting effect on the American economy. It may well affect our future security as a nation. That's how important is the engineering manpower problem.

The Engineers' Joint Council has estimated that 60,000 freshmen will have to enter engineering schools this semester in order to insure the normal demand for new engineers four years hence. This is about a tenth of all male school graduates and just double the number that normally go into technical colleges. Yet there are many persuasive reasons for urging this greater enrollment.

A recent survey reported in the *Industrial Bulletin* of Arthur D. Little, Inc., shows that industrial hiring of research personnel this year will double the 1950 rate. In 1940, about 302,000 chemists and engineers were employed; now the figure is around 500,000. Last year military research alone took 54,000 scientists and engineers—47 percent of the country's total research personnel. The military budget for fiscal 1952 is estimated at $2.3 to $2.4 billion for research and development, compared with $1.38 billion for 1951. This means that perhaps as many as 70 percent of all research scientists and engineers will be working on government projects. Add to this the number taken by the Armed Forces for the organized reserves, and by the draft, and it becomes evident that many of industry's engineering needs must go unfilled.

It's not too late to help offset this dangerous situation. Urge properly qualified high-school graduates to enroll in engineering courses. Discuss opportunities realistically with college students who may be interested in engineering careers. Finally, do your part to make those opportunities so challenging that they will attract and hold young men and women of highest caliber. Their services will be sorely needed.

The Tax That Kills

No one needs to be reminded of the increasingly high mortality rate among professional men. Just when we most need their skill and experience, eminent doctors, lawyers—yes, and engineers and scientists, too—are victims of heart attack or crippling diseases. Why? One answer appeared recently in a thoughtful column by George Sokolsky. He lays at least part of the blame at the door of the tax collector!

"When the professional man hits the higher brackets, his taxes consume so large a share of his income that he cannot hope to set aside much for the day when his reflexes are no longer what they should be . . . in his later years he can find himself in financial difficulty even though his experience is invaluable . . . One of the highest mortality groups in the United States is the medical profession, for while doctors can advise others to take it easy, they cannot afford to take their own advice . . . they have to go on working until they drop."

The same situation is evident among scientists and engineers. More and more young people are beginning to question the economic values in spending long years of preparation for professional careers. They see such men facing real hardships not only in acquiring their technical educations, but also during the eight or ten years spent in gaining necessary experience before they can earn really adequate incomes. If they are successful they may begin to make fair money by the time they are forty-five or fifty. That leaves them only fifteen or twenty years in which to set aside enough for their old age. Very few can do that—and at the same time pay out 30 to 60 percent of their income in higher taxes.

Thus the professional man is at a disadvantage compared with salaried personnel whose higher incomes at the start are spread out more uniformly over the years. Their total tax is considerably smaller and thus they are able to start saving or contribute to a pension plan at a much earlier date.

Sokolsky says: "If a corporation can set aside a reserve to take care of obsolescence in machinery, why may not a citizen protect himself against his own obsolescence?" We all know how difficult it is under present laws. If you are interested in seeing them changed to permit professional people to provide for their own future during periods of maximum earnings, write to Congressman Clifford Davis of Memphis, Tenn., or Congressman Frederic R. Coudert, Jr., of New York City, for copies of the bills they propose as remedial legislation.

NEW DATA FOR . . .

Heat Transfer to Fluidized Solids

Much has been published on heat transfer to fluidized beds. Here are coefficients for high solids-content mixtures in pneumatic flow.

R. A. KOBLE, J. N. ADEMINO, E. P. BARTKUS and T. E. CORRIGAN

In connection with a Bureau of Mines study of methods of synthesis gas production, West Virginia University chemical engineers undertook a preliminary study of the heating of fluidized solids being transported through a concentric pipe heat exchanger. Data obtained in this study were primarily intended to apply to design of a preheater for solids being fed into a solids-gas reactor in the dense-phase fluidized state.

The need for such data was recognized by bureau personnel.[6] Investigations of heat transfer to fluidized solids which have been reported in the literature thus far have been limited to the fluidized bed. There have been, as far as is known, but few attempts to heat solids in pneumatic flow.

Sadler,[7] in a review of pneumatic conveying, mentioned an attempt to preheat indirectly a pneumatically conveyed kiln feed by means of flue gas. This attempt was largely unsuccessful for two reasons—solids concentration was too low and the high velocity of the solids-air mixture did not allow adequate residence time in the heater.

The fluidizing feeder developed by Albright *et al*[3] has overcome these two difficulties. It has made practicable the conveying of solids at high concentrations and low linear velocities. With this feeder, heating of dense-phase solids-air mixtures in transit is now possible.

Studies have been made by Mickley and Trilling,[4] Leva *et al*,[5] Kettenring *et al*,[2] and Levenspiel and Walton[1] of heat transfer to fluidized beds. In these studies, heat was transferred to the fluidizing air in the presence of a fluidized solid. In the investigation reported here, both the solids and air were simultaneously being moved and heated. Such variables as particle size and air velocity, however, should have similar effects in the two methods of heating.

This report is limited to a study of the effects on heat-transfer coefficients of mass velocity of air, G_a, and mass velocity of solids, G_s. Two solids were used—a 40-micron pulverized Wyoming soft coal and a pulverized limestone of approximately 200 mesh.

APPARATUS AND PROCEDURE

An air dryer, a fluidization column, a heat exchanger, and a solids receiving drum made up the test apparatus. Dried compressed air, after passing through a pressure regulator, a rotameter, and a surge tank, was introduced into the bottom of the fluidization column. The column was made of a 20-ft. length of standard 10-in. steel pipe. Solids were charged batchwise from a hopper near the top of the column.

Research Assistants KOBLE *and* ADEMINO, *Assistant Professors* BARTKUS *and* CORRIGAN *made this study while at West Virginia University, Morgantown, W. Va. Mr. Ademino is now an instructor in chemical engineering at Villanova College, Villanova, Pa. Drs. Bartkus and Corrigan are now employed by industry, with Du Pont at Wilmington and Vulcan Copper & Supply at Cincinnati, respectively. Mr. Koble remains at Morgantown.*

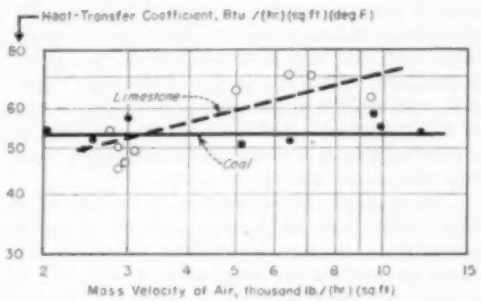


Fig. 1—Over-all coefficients vs. air velocity, with solids velocity constant. Solids-air ratios were 30 lb./lb. or more.

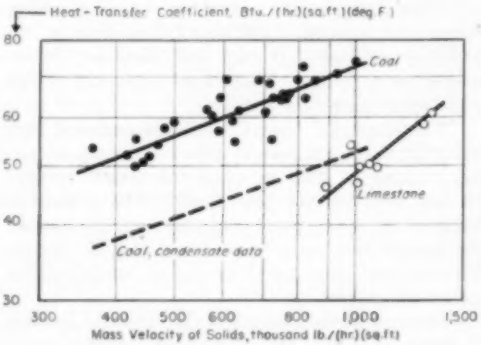


Fig. 2—Over-all coefficients vs. solids velocity. Slopes and positions of curves provide clues as to types of flow involved.

Fluidized solids were carried from the column through a ¾-in. O.D. copper tube. A 6-ft. length of this tube was enclosed by a jacket of 2-in. iron pipe, with provisions for introducing steam. Condensate was recovered in a pressure receiver. Thermocouples of 30-gage iron-constantan, projecting into the tube to its center, measured the inlet and outlet temperatures of the solids-air mixtures.

The heated solids were weighed continuously as they were separated from the conveying air in a 30-gal. drum receiver on scales. The conveying air passed through a dust filter and a wet test meter on its way to the atmosphere.

Each run was preceded by a ½-hr. warm-up period to bring fluidizer conditions to equilibrium. The length of runs ranged from 10 to 20 min.

Data recorded included barometric and steam pressures,

steam temperature, weight of condensate, inlet and outlet temperatures of fluidized solid stream, volume of air, weight of solids, and time. To calculate the heat-transfer coefficients from these data, three assumptions were made:

1. Temperatures of conveying air and suspended solids were the same at any point along the heat exchanger, so that the thermocouples at the inlet and outlet of the exchanger would read the actual temperature of the mixture.

2. Specific heat of limestone was 0.22 Btu./(lb.)(deg. F.); of coal, 0.3 Btu./(lb.)(deg. F.).

3. The actual thermal driving force along the length of the heater was equal to the log mean temperature difference.

Rates of flow of solids and air were determined from rectangular plots of the weight of solids collected during the run and the volume of air discharged *vs.* time. The slopes of the lines indicated the rates. Absolute densities of the coal and limestone were determined experimentally.

EXPERIMENTAL RESULTS WITH COAL

The effect of air velocity on heat-transfer coefficient to coal-air mixtures was measured by plotting coefficients *vs.* air velocity at essentially constant rate of solids feed (Fig. 1). Even though air velocity varied over quite a wide range, the effect on coefficient was not detectable. The rate of solids feed corresponded to a mass velocity of about 400,000-500,000 lb./(hr.)(sq. ft.) and was the lowest range of rates used in these experiments. It is evident that at these solids rates, the air film resistance was already small and was little affected by changes in air velocity. At some unknown lower solids flow rate, air velocity would probably begin to affect the coefficient noticeably.

In the tests on coal, therefore, it was evident that velocity of the solids was controlling. Its effect is shown in Fig. 2, a plot of heat-transfer coefficient, U, vs. solids mass velocity, G_s. The slope of the straight line representing all of the data on coal is 0.39, and the resulting equation is

$$U = 0.32\, G_s^{0.39} \qquad (1)$$

The value of the fractional exponent is fairly close to the $\frac{1}{3}$ exponent in the Sieder-Tate equation for heat transfer to viscous liquids in streamline flow.[4] This suggests the possibility of streamline flow in this range of data. Albright *et al*[1] found that the friction factor for flowing fluidized coal obeyed the equation

$$f = Re/16 \qquad (2)$$

which is further indication of the possibility of streamline conditions.

Accurate determination of Reynolds numbers was impossible in the absence of reliable viscosity data. Albright[1] had previously estimated the viscosity of fluidized coal in transit as 0.6 centipoise, based on pressure drop measurements. He attempted also to measure viscosity of a fluidized bed of coal with a Stormer viscosimeter, but encountered considerable difficulty in operating the instrument. The viscosimeter work, however, indicated that the viscosity value calculated from flow data was of the proper order of magnitude.

Based on this estimated viscosity of 0.6 cp., Reynolds numbers for the present work ranged from 4,200 to 12,600. Although these values are in what is considered the normal transition range for homogeneous fluids, various Bureau of Mines investigators believe that the presence of fluidized solid particles restricts turbulence so that streamline flow persists into the normal transition range. The appearance of the flow as well as the exponent of G_s in Eq. 1 suggest that streamline flow prevailed in these tests.

RESULTS WITH LIMESTONE

With limestone, a plot of heat-transfer coefficient vs. air mass velocity, G_a, at a limestone mass velocity, G_s, of about 900,000 to 1,000,000 (Fig. 1), indicates that air velocity has a measurable effect on coefficient. The data are too scattered to draw a definite conclusion, but a slope of about 0.25 on the log-log plot looks reasonable. Further investigation of this effect is under way.[9]

Because of this effect, the plot of data in Fig. 2 for coefficient vs. limestone mass velocity was made only for points taken at a relatively constant air velocity of about 3,000. The empirical equation developed from this plot is

$$U = 0.00078\, G_s^{0.8} \qquad (3)$$

This indicates the possibility of turbulent flow, or at least flow in the transition range. Using the same viscosity as for coal, 0.6 cp., the Reynolds numbers were found to be of the order of 12,600.

For all runs on coal, values of the coefficients based on the steam condensate were about 27 percent lower than those calculated from the specific heat, temperature rise, and mass of the solids-air stream. This difference may be due to use of an incorrect specific heat of coal. Or, possibly, temperature of solids at the outlet was lower than that of the air, instead of equal, as assumed.

If the condensate data were used in the calculation of the over-all coefficient for coal, the broken line shown in Fig. 2 would result. This line agrees well with the data on limestone if a transition from streamline to turbulent flow is regarded as occurring at the break in the lower curve.

CONCLUSIONS

In summary, the heat-transfer coefficient for condensing steam to coal-air mixtures was found to be a unique function of the mass velocity of the coal, varying with the 0.39 power. For limestone, the coefficient varied with both air velocity and solids velocity. The variation with air velocity was to about the 0.25 power, and with mass velocity to the 0.8 power. The positions of the corresponding curves, as well as the values of these exponents, suggest that the coal may have been in streamline flow and the limestone in transition or turbulent flow.

Coefficients were in the range of 45 to 75, which is the same range as those reported for fluidized beds. This suggests that the tortuous movement of particles from the upper part of fluidized beds to the lower, and vice versa, is not the only reason for improved heat transfer found in fluidized systems.

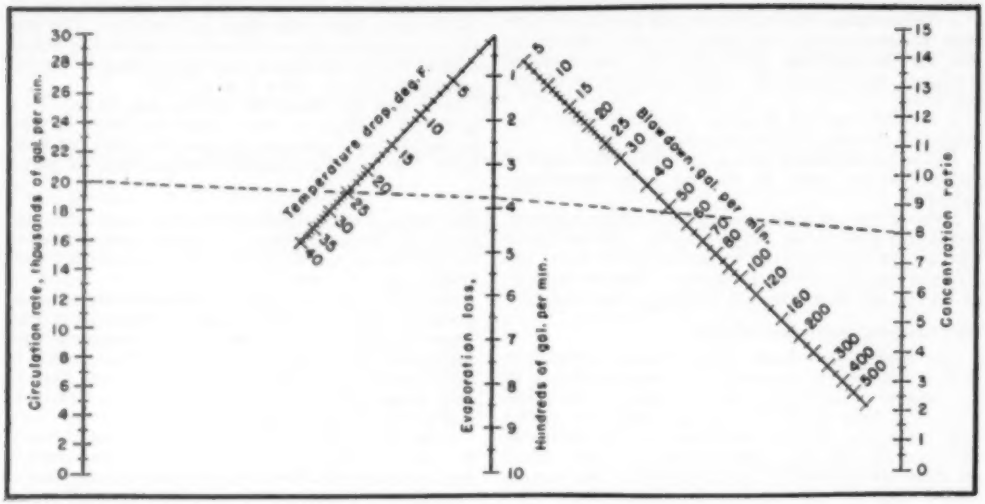
This investigation is being extended to a study of other systems and a wider range of variables.

ACKNOWLEDGEMENT

The authors wish to express their appreciation to the United States Bureau of Mines Station at Morgantown, W. Va., for the use of the fluidizer and pulverized coal, and to the Greer Limestone Co., who furnished the pulverized limestone.

REFERENCES

1. Albright, C. W., Holden, J. H., Simons, H. P., and Schmidt, D. L., *Chem. Eng.*, June 1949, p. 105.
2. Kettenring, K. N., Manderfield, E. L., and Smith, J. M., *Chem. Eng. Prog.*, 46, 139 (1950).
3. Leva, M., Weintraub, M., and Grummer, M., *Chem. Eng. Prog.*, 45, 563 (1949).
4. Lavenspiel, O., and Walton, J. S., *Eng. Exp. Stat. Bull., Oregon State College Reprint Series*, No. 32, 1949.
5. Mickley, H. S., and Trilling, C. A., *Ind. Eng. Chem.*, 41, 1135 (1949).
6. Perry, J. H., "Chemical Engineers' Handbook," 3rd ed., 471, McGraw-Hill Book Co. (1950).
7. Sadler, A. M., *Chem. Eng.*, May 1949, p. 110.
8. Schmid, W. E., West Virginia University, Engineering Experiment Station, personal communication, April 5, 1951.
9. Sebastian, J. J. S., U. S. Bureau of Mines, personal communication, Sept. 1949.


Circulation rate, thousands of gal. per min.
Temperature drop, deg. F.
Evaporation loss, Hundreds of gal. per min.
Blowdown, gal. per min.
Concentration ratio

Plant Operating Chart for Cooling Tower Systems

ROBERT L. AHLNESS, *Chemical Engineer, Philrich Branch, Phillips Chemical Co., Borger, Texas.*

★July Contest Prize Winner

This alignment chart offers a rapid method of determining the evaporation loss, blowdown, and required makeup for a cooling tower system. The chart also illustrates the water savings which may be realized by maintaining a tower system at a higher concentration ratio.

Example—A cooling tower has a circulation rate of 20,000 gpm. and a temperature differential through the tower of 25 deg. F. The concentration ratio carried in the system is 8. Consider windage losses negligible. What blowdown and makeup are required?

Solution—Connect 20,000 gpm. on the left vertical scale with 25 deg. F. on the diagonal. Read 375 gpm., the evaporation loss, on the center vertical scale. Now connect the evaporation loss with the concentration ratio of 8 on the right vertical scale and read the required blowdown, 54 gpm., on the diagonal. The makeup required is the sum of the evaporation loss and the blowdown or 429 gpm.

The evaporation loss determined by this chart assumes 75 percent of the total cooling is accomplished by evaporation and the remainder by convection. This percentage may vary from 85 percent in summer to 65 percent in winter. The concentration ratio is the ratio of chlorides in the makeup water to chlorides in the tower basin. This ratio varies with the characteristics of the makeup water.

The windage loss is dependent upon the type of tower. In a well designed tower it should not exceed one-tenth of 1 percent of the circulation rate. If the windage loss is significant it should be subtracted from the blowdown figure given by the chart to give true blowdown.

Simple Test Finds Faulty Operation Of Deaerating Feedwater Heater

MURRY L. OLIVER, *Industrial Chemist, Hopewell, Va.*

In the operation of a deaerating boiler feedwater heater, it is necessary to make a periodic check of the efficiency of

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★August Contest Prize Winner

"Indirect Pumping System Averts Corrosion and Packing Gland Leakage."

A prize of $50 in cash will be awarded to Harold F. Reichard, chemical engineer, the Kellex Corp., Jersey City, N. J. The prize winning entry will appear in the October issue.

$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering* will award $50 cash each month to the author of the best short article received that month and accepted for publication in the Plant Notebook.

The winner each month will be announced in the issue of the next month, e.g., the September winner will be announced in October and his article published in November. Judges will be editors of *Chemical Engineering*. Non-winning articles submitted for this contest will be published if acceptable at space rates.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 500 words, but illustrated if possible.

Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries. Also, novel means of presenting useful data are acceptable. Address Plant Notebook Editor, *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y.

the heater in removing dissolved oxygen and carbon dioxide. This usually requires the services of a chemist.

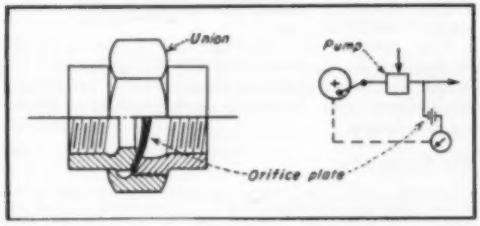
As a rule, deaerating heaters operate efficiently over a long period of time, which may cause laxity in checking the deaerator. However, a time may come when this equipment will not function properly, and the trouble is usually found after the corrosive damage has been done to an economizer or boiler feedwater lines.

The sodium carbonate usually present in boiler water breaks down at drum pressure and temperature to a certain degree to sodium hydroxide and carbon dioxide. The carbon dioxide passes out with the steam, which reduces the pH of the condensed steam. In a manufacturing process the condensed steam is usually returned to a hot-well and then pumped to a deaerator heater. A vent condenser is usually attached to a deaerator heater to conserve heat that otherwise would be wasted by blowing to the air. Part of the makeup water passes through the vent condenser and condenses the water vapors.

If the deaerator heater is not functioning properly, the dissolved oxygen and carbon dioxide will not be removed satisfactorily and consequently the pH of the deaerated water will be considerably reduced and the dissolved oxygen increased.

As an example a properly operating deaerator heater with makeup zeolite-treated water will produce deaerated water with practically 0.00 ppm. dissolved oxygen and a pH of 8.2-8.6. Faulty operation of the deaerator heater may reduce the pH of the deaerated water to 6.4-6.7 pH, and raise the dissolved oxygen to 0.1 to 0.7 ppm., which is very corrosive to economizers and boiler feedwater lines.

The efficiency of a deaerator is judged by the dissolved oxygen in the deaerated water, a test that requires the services of a chemist. However, by the use of a simple pH test, it is possible to judge the performance of a deaerator. The pH test may be performed by the fireman or some other designated person. A daily routine pH test of a cool condensed sample from the boiler feed pump will indicate the efficiency of the deaerator in removing carbon dioxide, which has a direct relationship to the amount of dissolved oxygen present. If the fireman finds a considerable drop in the pH of deaerated water, the chemist should be notified. The chemist should then check the deaerated water for dissolved oxygen and carbon dioxide, and locate and eliminate the trouble.



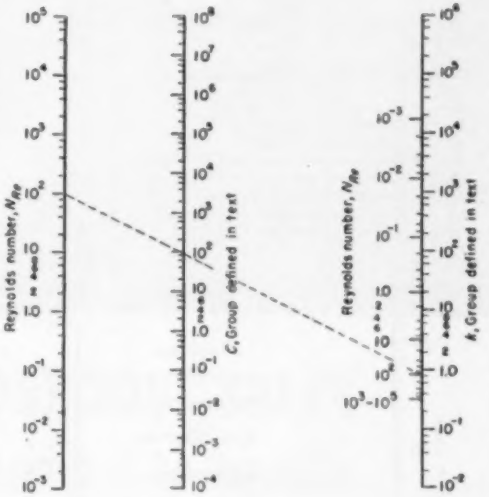
Simple Orifice Assembly Made From Pipe Union

MARSHALL SITTIG, *Chemical Engineer, Detroit, Mich.*

A useful orifice assembly may be quickly made up and installed where it is needed. It consists of a disk fitting in the seat of an ordinary pipe union as shown in the sketch. Depending on the fluid in the line and the operating conditions, the disk may be thin sheet metal (for example, copper) or plastic (for example, polyethylene). It is particularly applicable to experimental installations because of its ease of installation and replacement of the ordinary "orifice plate."

We encountered trouble with an on-off maximum pressure controller on an electrically driven reciprocating pump. On the high-pressure end of the stroke, the switch contacts would close and the motor would stop. Then, as the piston came back, valve leakage would permit the pressure to fall just below the set point and the motor would start. This continued for several strokes until the pump finally shut off. In the meantime, arcing occurred across the fluttering switch points. A pinhole orifice of the type shown was installed in the line between the pump and the switch and thenceforth the pump clicked off sharply.

In another case, in instrument lines on a fluidized solids pilot plant, bleeding gas from the instrument into the process line was inadequate. Fines sifted into the ¼-in. instrument leads and gradually plugged them. Then, a tiny orifice of the type shown was installed close to the solids-bearing gas line and plugging of the leads was completely eliminated.



Nomograph Helps Determine Particle Free Settling Rate

S. M. WALAS, *Associate Professor of Chemical Engineering, University of Kansas, Lawrence, Kas.*

The rate of settling of particles in a fluid is expressed by the equation:

$$u^2 = \frac{gd}{k}\left(\frac{\rho_s - \rho_L}{\rho_L}\right) \qquad (1)$$

Only when the particles are small spheres does this reduce to Stokes' law, in which case the resistance factor k becomes $k = 18/d$.

In general, k is a function of the Reynolds number, $N_{Re} = du\rho_L/\mu$. In this respect it is analogous to the Fanning friction factor which occurs in the equation for pressure drop in flow through pipe lines. Such a plot of the resistance factor k versus the Reynolds number is given, for example, by Gaudin in "Principles of Mineral Dressing", page 177 (McGraw-Hill Book Co., Inc., New York, 1939).

Since N_{Re} involves the velocity, the evaluation of the settling rate ordinarily requires solution by successive approximation. However, the accompanying chart enables these trial calculations to be made quite simply. This chart consists of a scale for N_{Re}, a scale for C, and a combined scale for N_{Re} and k which is a replot of the resistance factor plot given by Gaudin. To use the chart, the value of C is first calculated, then located on the scale marked C. A straightedge is pivoted about this point until the same value of N_{Re} is located on each of the other two scales. This is the proper value of N_{Re}. From this the settling velocity is calculated from the equation:

$$u = \mu N_{Re}/d\rho_L \qquad (2)$$

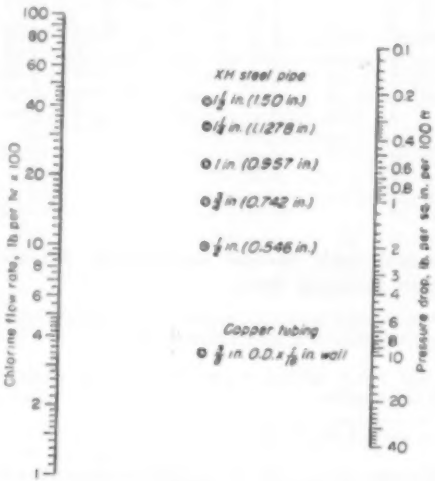
The group of terms designated by C arises on substitution of u from Eq. (1) into the Reynolds number, thus:

$$N_{Re} = \frac{du\rho_L}{\mu} = \frac{d\rho_L}{\mu}\sqrt{\frac{gd}{k}\left(\frac{\rho_S - \rho_L}{\rho_L}\right)} = \sqrt{\frac{d^3\rho_L(\rho_S - \rho_L)}{k\mu^2}} = \frac{C}{\sqrt{k}} \qquad (3)$$

The example on the chart shows that when $C = 95$, the proper N_{Re} is 100.

NOMENCLATURE (Consistent units)

- C = $\sqrt{d^3\rho_L(\rho_S - \rho_L)/\mu^2}$
- d = Diameter of particle.
- g = Gravitational constant.
- k = Resistance factor, defined by Eq. (1).
- N_{Re} = Reynolds number.
- ρ_L = Density of fluid.
- ρ_S = Density of particle.
- μ = Viscosity of fluid.


Chlorine flow rate, lb per hr x 100
Pressure drop, lb per sq in. per 100 ft
XH steel pipe
1½ in. (1.50 in.)
1¼ in. (1.278 in.)
1 in. (0.957 in.)
¾ in. (0.742 in.)
½ in. (0.546 in.)
Copper tubing
⅞ in. O.D. x ⅛ in. wall

Nomograph for Pressure Drop in Liquid Chlorine Lines

D. S. Davis, *Virginia Polytechnic Institute, Blacksburg, Va.*

The widespread industrial use of liquid chlorine and its ready availability in tank cars have suggested the need for a convenient and accurate graphical means of estimation of its pressure drop when it is flowing in extra-heavy steel pipe of various sizes. The accompanying nomograph permits rapid calculation of the pressure drop of liquid chlorine at flow rates between 100 and 10,000 lb. per hr. in extra-heavy steel pipe of nominal diameters of ½ to 1¼ in. and in ¾-in. copper tubing.

The use of the chart, constructed by methods described previously[1] from data given in a manufacturer's handbook,[2] is illustrated as follows: What pressure drop may be expected when liquid chlorine is flowing at the rate of 4,600 lb. per hr. in 1-in. extra-heavy steel pipe? Connect 4,600 on the flow-rate scale at the left with the gage point marked 1 in. and note the intersection with the pressure-drop scale at 2.00 psi. per 100 ft. of pipe.

A pressure drop of 0.5 psi. per 100 ft. of ¾-in. extra-heavy steel pipe is available. What is the maximum possible rate of flow of liquid chlorine? Align 0.5 on the pressure-drop scale with the gage point for ¾-in. pipe and not the intersection with the flow-rate scale at 1,020 lb. per hr.

What size extra-heavy steel pipe should be used so that the pressure drop for liquid chlorine flowing at 5,000 lb. per hour should not be greater than 0.80 psi. per 100 ft. of pipe? Note that a straight line connecting 5,000 on the flow rate scale and 0.80 on the pressure drop scale would cross an imaginary line connecting the gage points for the pipe sizes just below that for 1¼-in. pipe, indicating that pipe of this size (next standard size) would be required.

REFERENCES

1. Davis, D. S., "Empirical Equations and Nomography," Chap. IX, New York, McGraw-Hill Book Co., 1943.
2. "Chlorine Handbook," p. 22, Diamond Alkali Co., Cleveland, Ohio.

Pipe Spacing Chart Saves Pipe Layout Time

James N. Robinson, *Phillips Chemical Co., Dumas, Tex.*

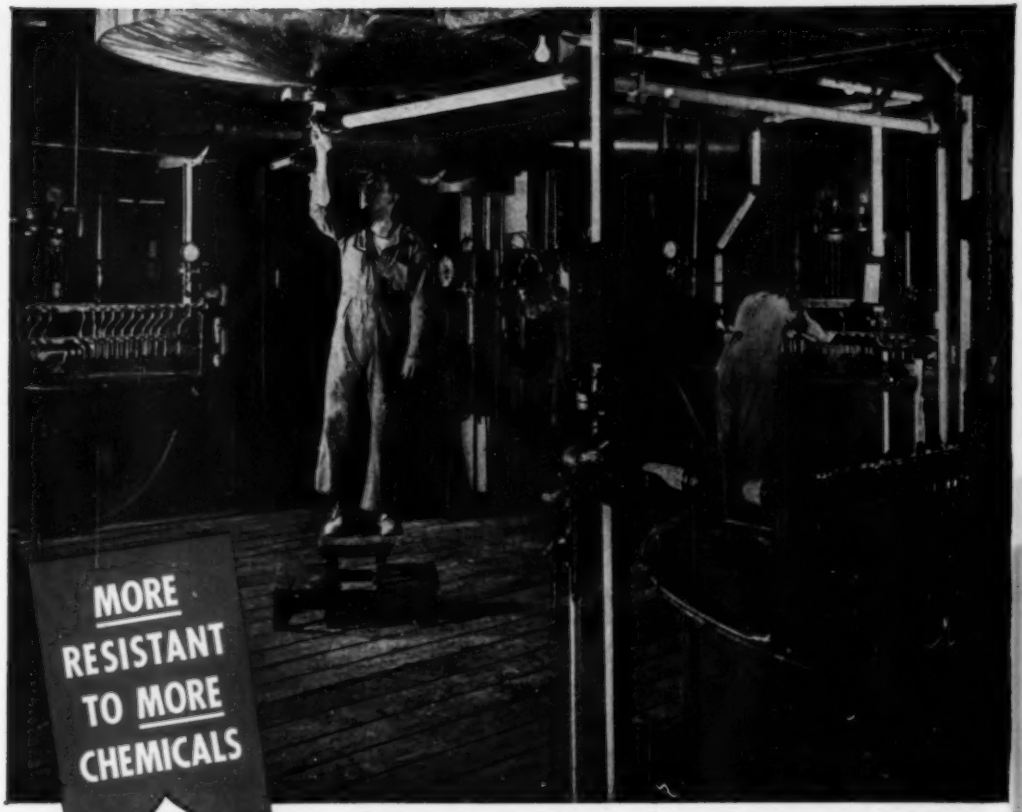
Considerable time in laying out piping lanes and other piping arrangements can be saved by the use of the accompanying pipe spacing chart. The chart was developed by allowing a clearance of from 1 to 2 in. between adjoining 300-psi. flanges on parallel pipelines of various sizes between 2 and 24 in. i.p.s.

Note, however, that the chart does not allow for the thickness of any insulation that may be applied over the flanges, so that an additional clearance must be provided for insulated pipes, depending on the method of insulating the flanges.

Pipe Spacing Chart

Select size of one pipe from a horizontal row, and size of the second pipe from a vertical column. At intersection of row and column find the center-to-center spacing recommended. With 300-psi. flanges this spacing will allow a clearance between flanges of from 1 to 2 in. No allowance is made for insulation which is extra.

Pipe Size, In.	O. D., In., 150-Psi. Flange	O. D., In., 300-Psi. Flange	Pipe Size, In. 2	3	4	6	8	10	12	16	20	24
2	6	6½	8	9	10	11	12	13	15	17	20	23
3	7½	8½	9	10	11	12	13	14	16	18	21	24
4	9	10	10	11	11	13	14	15	17	19	22	24
6	11	12½	11	12	13	14	15	16	18	20	23	26
8	13½	15	12	13	14	15	16	18	19	22	24	27
10	16	17½	13	14	15	16	18	19	20	23	25	28
12	19	20½	15	16	17	18	19	20	22	24	27	30
16	23½	25½	17	18	19	20	22	23	24	27	29	32
20	27½	30½	20	21	22	23	24	25	27	30	32	35
24	32	36	23	24	24	26	27	28	30	32	35	37



HOT CORROSIVE SALTS almost too hot to handle

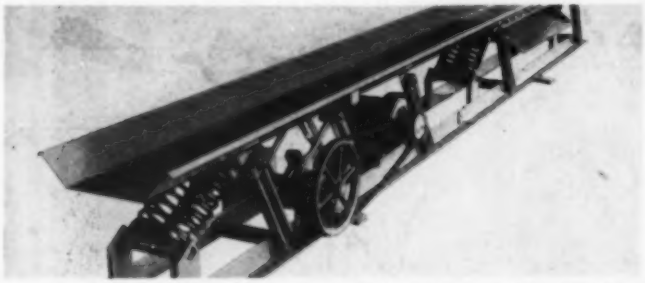
FOUR TIMES A DAY, metallic salts in hydrochloric and hydrofluoric acid solutions are heated to a near boil and cooled to room temperature, in these digesters and crystallizing tanks. The hot acids are extremely corrosive, and the constant change of temperature is rough on the tanks. Most materials would not stand up or would be too expensive.

Best answer was found in ACE hard rubber linings—the two-layer protection that is both chemically strong, and mechanically tough. Approximately 40 ACE rubber-lined tanks are now in service in this plant. Many have been on the job for eight years.

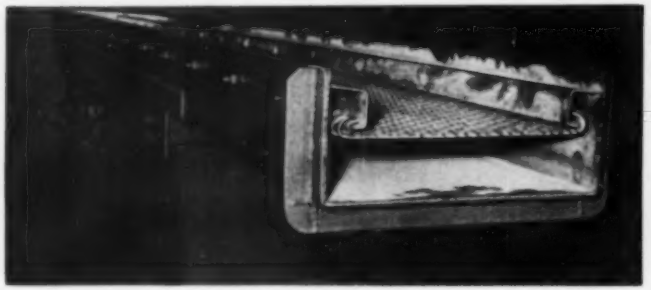
The fume ducts in the background, incidentally, handle hydrofluoric acid vapors. They, too, are ACE protected.

ACE hard rubber resists all alkalies, metallic salts, inorganic acids, hydrochloric acid any strength, nitric acid to 16° Be, sulphuric acid to 50° Be, phosphoric acid to 75%, and countless other corrosives. Other ACE plastics extend this range still further. Ask for catalogs of ACE-Clad and ACE-molded chemical equipment.

MATERIALS HANDLING



OPEN TROUGH is used on this conveyor. Covered troughs and totally enclosed tubes can be used instead when desirable.



SCREENING is combined with conveying here. Materials of any predetermined size can be drawn off at any desired point.

SPIRAL job elevates 6,000 lb. per hr. of a plastic compound.

Conveyor Vibrates at Natural Frequency

Low power consumption and maintenance costs, greater capacity claimed for this new development.

(180A) A new vibrating conveyor operates on the principle of "doin' what comes natcherly." Consisting of a steel pan or tube mounted on springs and vibrated by a motor-driven eccentric, this conveyor operates at the exact natural frequency of the springs.

Remember, before the days of shock absorbers, the ease with which you could rock a heavy car up and down? Little force was required to rock the car as long as you followed the natural frequency of the springs—but to rock it a little faster, or a little slower, would have required far more power than you had. This is the principle which has now been applied to vibrating conveyors.

The obvious advantage of the Natural-Frequency conveyor is its low power consumption, claimed to be less than half the power required for all other types of vibrating conveyors moving the same materials at the same speeds. When the conveyor is assembled at the factory, the drive speed is varied up and down to find the speed at which power consumption, as indicated by an ammeter, is a minimum. This speed corresponds to the natural frequency of the spring-mounted pan. The adjustable pulley is then locked permanently.

Maintenance costs are said to be very low. The Natural-Frequency conveyor has no bearings, bushings, or moving parts except in the drive mechanism. In addition, its capacity is claimed to be at least twice as great as competitive conveyors, width for width and horsepower for horsepower. It will move materials as fast as 24 in. per sec. on flat hauls. These advantages all add up to low conveying costs.

The Natural-Frequency conveyor is available in single units of any length from 5 to 200 ft., with pans of any thickness required, and in widths of 6, 12, 18, 36, and 48 in. Only one motor drive is required for each 150 ft. of length.

The same design principles have been applied to spiral conveyors for moving materials vertically. They are designed in such a way that the spiral itself can continue through the round ring which supports the springs and drive. Since a spring support is needed approximately every 20 ft., a spiral conveyor 100 ft. high would be made in one solid section with spring supports at each floor level. One drive—placed at any convenient level—would

be sufficient to operate this 100-ft. spiral. Where the weight of conveyed material is unusually heavy, two or more drives may be required. However, they need not be timed together, since the principle of natural frequency under which they operate makes it impossible for them to operate out of timing with each other.

Vibrating conveyors are particularly useful where you want to cool, dry, blend, or screen while conveying. They can be used for any material which will not cling to the pan or bulk up because of aeration.—*Whitley-Carrier Co.*

Horizontal Belt Conveyor With Adjustable Dimensions

(*181A*) A new horizontal belt conveyor can be adapted to a wide range of conditions. Length may be varied from 10 to 60 ft., height is adjustable from 21 to 40 in., belt speed may be varied from 5 to 100 fpm., and belt direction may be reversed. Belt widths available range from 10 to 20 in.—*Rapids-Standard Co.*

Bin Vibrator Operates Sans Noise

(*181B*) No noise annoys when you use an air-operated bin vibrator recently put on the market. The reciprocating of a hard chrome-plated piston develops the vibrating action. The piston is cushioned at each end of its stroke, however, by a trapped pocket of air. Like other air vibrators, vibration intensity can be varied at will.—*Cleveland Vibrator Co.*

Equipment Cost Indexes

(Marshall and Stevens Indexes of Comparative Equipment Costs, 1926 = 100)

Industry	June 1950	Mar. 1951	June 1951
Average of all	163.1	181.2	180.9
Process Industries			
Cement mfg.	158.1	174.0	173.1
Chemical	166.1	182.0	181.1
Clay products	153.1	169.0	168.1
Glass mfg.	156.2	172.1	171.2
Paint mfg.	159.4	175.3	174.4
Paper mfg.	159.7	175.6	174.7
Petroleum ind.	162.5	178.4	177.5
Rubber ind.	164.9	180.8	179.9
Process ind. avg.	163.5	179.4	178.5
Related Industries			
Elec. power equip.	167.7	183.6	182.7
Mining, milling	166.8	182.7	181.8
Refrigerating	179.4	201.0	200.5
Steam power	154.8	171.2	170.3

Compiled quarterly for March, June, September, and December of each year by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. Indexes are prepared for 47 different industries, from which the eight process and four related industries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, **Chemical Engineering**, Nov. 1947, pp. 124-6. For a listing of annual averages since 1913 see **Chemical Engineering**, Feb. 1951, p. 158.

IN BRIEF—A capsulated listing of this month's newsworthy equipment.

		Page
Materials Handling Equipment		
Vibrating Conveyor	Operates at natural frequency	180A
Belt Conveyor	Adjustable length, height, and speed	181A
Bin Vibrator	For quiet operation	181B
Fork Truck	Useful in crowded areas	181C
Portable Conveyor	Light in weight, adjustable	181D
Fluid Flow Equipment		
Packless Pump	For high-pressure pumping or homogenization	182A
Turbine Pump	World's largest, 2,500 hp	182B
High Vacuum Valve	Large butterfly type, easy to open	182C
Aluminum Pipeline	Underground test shows favorable results	182D
Metering Pumps	Stainless steel, easily cleaned	182E
Rotary Joints	Self-supporting type for 250 psi	182F
Solenoid Valve	Overcomes spool sticking in hydraulic systems	182G
Solenoid Valve	Three-way, for alternate opening and closing	182H
Expansion Joint	Made of Stainless No. 20	182I
Heating and Cooling Equipment		
Steam Generator	Packaged unit, requires no stack	184A
Radiant Heating Panel	Aluminum grid fused to tempered glass	184B
Heat Exchangers	Provide high surface-volume ratio	184C
Direct-Fired Heater	Integral finned tube and burner unit	184D
Steam Generator	Can develop 200 psi. in 2 min.	184E
Wrenches	Special tools for G-Fin maintenance	184F
Electrical and Mechanical Equipment		
Stuffing Box	Staged packing for high-pressures	187A
Time Delay Relay	Core moves through liquid silicone	187B
Speed Control	Voltage unbalance adjusts magnetic drive	187C
Laboratory Dishwasher	Washes and rinses automatically	188A
Gear Motor	Provides double torque rating	188B
Welding Electrodes	For depositing strong, hard overlays	188C
Tachometer	Again available in U. S.	188D
Air Handling Equipment		
Blow Rings	For bag filters, self-adjusting	188E
Fume Hood	Glass lining overcomes hazards	188F
Air Filter	Made of specially treated asbestos paper	188G
Dust Collector	Exhauster and separator in single unit	188H
Processing Equipment		
Liquid Filter	Areas from 1 to 42.6 sq. ft.	190A
Water Chlorinator	Special feeder uses HTH tablets	190B
Laboratory Kneader	One-pint miniature of plant machines	190C
Air Separation Plants	Packaged units for oxygen and nitrogen	190D
Ion Exchanger	Regenerated with ordinary salt	192A
Impact Breaker	Handles limestone and phosphates	192B
Safety Equipment		
Wheeled Extinguisher	Uses dry chemical, 150-lb. capacity	192C
Fog Nozzle	Connects to ordinary garden hose	192D
Mechanical Foam	Extinguishes polar solvent fires	192E
Sprinkler Head	Wide angle, for fixed piping systems	192F
Instruments and Controls		
Surface Tension Meter	Liquid rises between two glass plates	194A
Low-Range Tester	Increased range, other improvements	194B
Position Indicator	Two solenoids rotate indicating card	194C
Temperature Controls	Two instruments control four stills	194D
Dial Thermometer	Can be read from any angle	194E
Flow Integrator	Rapid scanning for high accuracy	194F
Gas Analyzer	Fractionates by adsorption	195A
Temperature Control	Uses a pilot air valve	195B
Thermostat	Expanding tube design uses various alloys	196A
Air Flow Switch	Sensitive to 0.2 in. water gage	196B
Moisture Detector	Marks wet lumber with red ink	197A
Air Pollution Meter	Records and integrates SO_2 concentration	197B
Geiger Counter	For high ambient temperature conditions	197C
Metal Detector	Four types of small-aperture inspection heads	197D

Don't Forget: Reader service postcard inside back cover will bring you more information. Use these key numbers

Packaging & Handling Briefs

Fork Truck—SpaceMaster 61, for areas where space is at a premium. Lewis-Shepard Products. (*181C*)

Portable Conveyor—New lightweight Adjustoveyor, companion unit to the basic model described in *Chem. Eng.*, Dec. 1950, p. 144. Stewart-Glapat Corp. (*181D*)

Packless High-Pressure Pump Doubles As a Homogenizer

(182A) A new high-pressure packless pump uses a synthetic rubber diaphragm. The pump is built in four sizes from 0.5 to 2.5 gpm. and for pressures up to 3,000 psi.

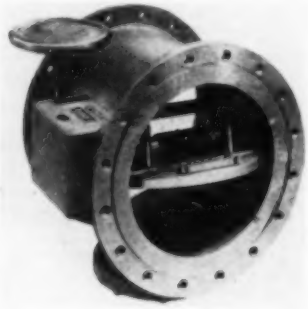
The pump mechanism delivers a pulsating oil pressure to one side of the diaphragm, or pulsator, which is shaped like a test tube. The pump, being a triplex design, delivers three pulsations for each shaft revolution to give fairly constant flow. The process liquid end of the pump is provided with ball check valves to convert pulsations of the diaphragm into flow of liquid.

All parts of the unit in contact with the pumped liquid are made of 18-8 stainless, with the exception, of course, of the diaphragm.

By adding a suitable valve at the pump discharge, you can use the unit as a homogenizer.—*Scott & Williams, Inc.*

LARGEST TURBINE PUMP

(182B) **This view during construction of New York City's new Hudson River pumping station shows one of the six 2,500 hp. vertical close-coupled pumps being installed. These pumps, said to be the largest of their kind in the world, consist of five stages, with 36-in. diameter bowls. They are rated at 14,000 gpm. each against a head of 600 ft. —Peerless Pump Div.**



High Vacuum Valve Is Largest of Its Type

(182C) A recently developed 16-in. high-vacuum butterfly valve is said to be the largest of its type. Even at that, it is much smaller than a rubber diaphragm valve of corresponding size. It is available in special metals for corrosive applications.

The valve handwheel is connected to a worm gear drive which enables the operator to spin the handwheel after it is started. Only 10 turns of the wheel are necessary to open and close the valve, and opening or closing requires only a few seconds, according to the manufacturer. A full-scale indicator shows the extent to which the valve is opened or closed.—*F. J. Stokes Machine Co.*

Underground Al Pipeline Shows Favorably in Test

(182D) A 40-ft. test section of bare aluminum underground pipeline in natural gas service was recently dug up and inspected after 17 mo. of service. No discoloration or corrosion of any sort was found. Based on this inspection, the engineers conducting the test feel that this pipe would last indefinitely under the conditions of service.

This test section was installed with special bypass valves so that it could be removed at intervals without disturbing the operation of the main 8-in. line serving the Listerhill, Ala., plant. —*Reynolds Metal Co.*

Stainless Metering Pumps Provide Smooth Flow

(182E) Three new stainless steel metering pumps, designed for easy cleaning and sterilization, have recently been introduced. These pumps are rated at deliveries up to 4,500 cc. per min. and are provided with two types of variable speed drive. They are said to provide a smooth, non-pulsating flow.—*Mechanical Products Corp.*

Fluid Flow Briefs

Rotary Joints—Self-supporting Type S now available in heavy-duty construction for operating pressures up to 250 psi. Johnson Corp. *(182F)*

Solenoid Valve—Pilot-operated, four-way, for use in high-pressure hydraulic circuits. Overcomes spool sticking by utilizing system pressures to move the spool.—Denison Engineering Co. *(182G)*

Solenoid Valve—Three-way, for alternate application and exhaustion of pressure to pneumatic and hydraulic operations. Automatic Switch Co. *(182H)*

(Continued)

CORROSION-RESISTANT JOINT

(182I) **Cook Electric Co. is now making bellows expansion joints for highly corrosive conditions from Carpenter Stainless No. 20. Ordinary stainless alloys were unsuitable for service involving such corrodents as 35 to 65 percent sulphuric acid and salt water. —Carpenter Steel Co.**

THE CARE AND NURSING OF TANK CARS

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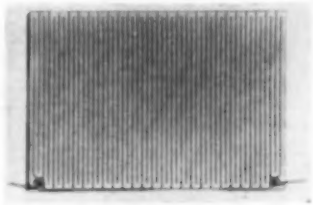
So many people have requested reprints of these cartoon advertisements that we are making them available to you for use in your shops. Just write us.

Packaged Steam Generator Requires No Stack

(184A) A new packaged steam generator, completely mounted, may be installed on level and solid floors without foundation construction. When service connections are made to fuel, water, and electrical supplies, the generator is ready for operation. No stack is required—a vent through the roof is sufficient.

These generators are available in sizes ranging from 690 to 10,350 lb. of steam per hr. when burning light oil or a combination of light oil and gas. Generators burning straight gas are available in the lower size range and those using heavy oil in the upper size range. A combustion efficiency of 80 percent is claimed.

The unit is designed for automatic and safe operation. All controls are contained in a single push-button control station. All safety features are designed to fail in a safe position in case of power breakdown.—*Titusville Iron Works Co.*



Radiant Heating Panel Aluminum on Glass

(184B) The Ra-Grid, a new glass radiant heating panel, consists of an aluminum grid about 0.001 in. thick fused to the back of a ¼-in. tempered glass panel. Heat-resistant enamel protects the grid from corrosion and abrasion.

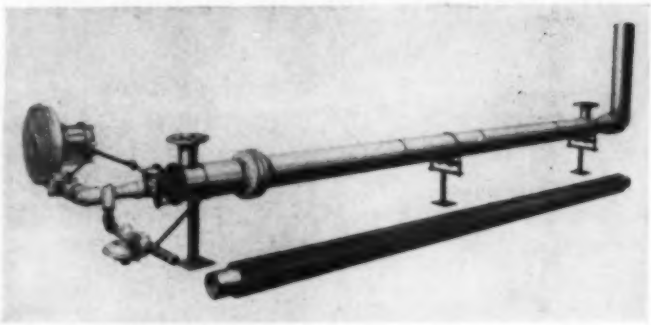
The panel operates at temperatures up to 300 deg. F. on 115 or 230 v. Maximum heat output is 3 w. per sq. in. with plate in free air at room temperature. Maximum panel size is 16x28 in.—*Blue Ridge Glass Corp.*

Aluminum Heat Exchangers Offer High Surface Ratio

(184C) A recently developed aluminum heat-transfer surface furnishes 450 sq. ft. of surface per cu. ft. of volume, a much greater ratio than that provided by normal shell-and-tube exchangers. It is fabricated entirely of aluminum, making it suitable for temperatures as low as −300 deg. F. Upper temperature limit is 500 deg. F.

This new surface is fabricated from layers of corrugated aluminum sheet, separated by thin plates, all brazed together in an exclusive flux bath process. The brazing process is the key to this product's success—joints are as strong as the aluminum itself.

The new surface can be used for all types of heat-transfer applications. Exchangers can be built for counterflow or crossflow circulation.—*Trane Co.*



NEW DIRECT FIRED HEATER USES FINNED TUBE

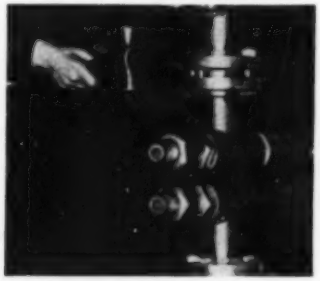
(184D) Recently developed Type 102 direct fired heater uses an integral one-piece extended surface tube as the heat transfer element. The unit consists of a stainless steel outer shell with expansion section and a finned Inconel center tube. With no refractories to warm up, the heater is quick starting and easily controlled. It is furnished complete with burner and controls.—Brown Fintube Co.

Steam Generator Pressure in Two Minutes

(184E) The Model 4740 Vapor-Clarkson steam generator can develop 200 psi. pressure in 2 min., starting with 50 deg. water, it is claimed. Its rated capacity is 4,800 lb. of steam at pressures up to 600 psi.

The unit is operated by a set of automatic controls, maintaining a predetermined steam pressure anywhere between 75 and 600 psi. Controls have been engineered for maximum safety.

Over-all size of this unit is 52 x 76 x 78 in. It comes as a complete package—all you do is connect water, fuel, and electricity.—*Vapor Heating Corp.*



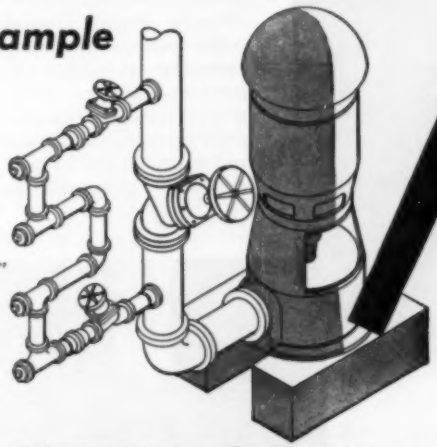
Special Wrenches For G-Fin Maintenance

(184F) If you are one of the many users of G-Fin heat exchange elements, you may find these new maintenance tools very handy. G-Fin elements are provided with union nuts and lock nuts instead of flanges, reducing the time to make or break joints and eliminating the many small nuts and bolts which would otherwise be necessary. Recently developed wrenches make this job still easier. Besides the strike wrench which the mechanic in the picture is using, you can get specially designed semi-box wrenches and socket wrenches.—*Griscom-Russell Co.* *(Continued)*

for outstanding service

on Corrosive Well Water

...for example



The Installation—
Barr Rubber Products Co.,
Sandusky, Ohio

PROBLEM: To eliminate costly seating and packing maintenance, and frequent replacement of valves on plant well-water pump. Valves previously used highly unsatisfactory, having maximum life of 6 months.

WORKING CONDITIONS: Sulphur content of water extremely high. Valve constantly exposed to severe corrosive and erosive effects. Operated infrequently; yet easy operation, positive seating are prime requisites.

SOLUTION TO PROBLEM: Crane Packless Iron Body Diaphragm Valves featuring separate disc and diaphragm design. Three-inch No. 1611 flanged end valve on main discharge; ¾-inch No. 1610 screwed end valves on by-pass.

RESULT: While other valves lasted only 6 months or less, Crane Diaphragm Valves show no effects of service, after more than a year. They operate smoothly . . . seat tightly . . . ; no maintenance whatsoever needed to date!

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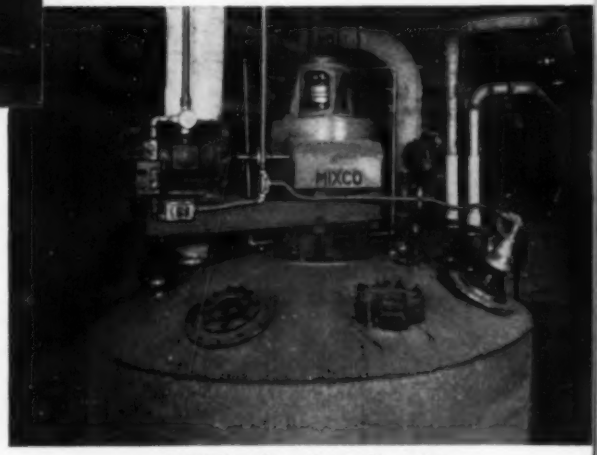

LIGHTNIN heavy duty turbine agitators

2. EQUIPMENT... Lightnin Mixers are *built for the critical years ahead.* They are constructed for continuous heavy duty, with minimum maintenance. Interchangeable components make it easy to change the mixer from one type of installation to another—even from one speed to another—as your requirements change. Spare parts are *standard* and can be replaced quickly by any workman.

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Turbine, propeller and paddle types. For open or closed tanks. 16 speeds available in new heavy duty drive. Sizes ⅛ to 300 HP.

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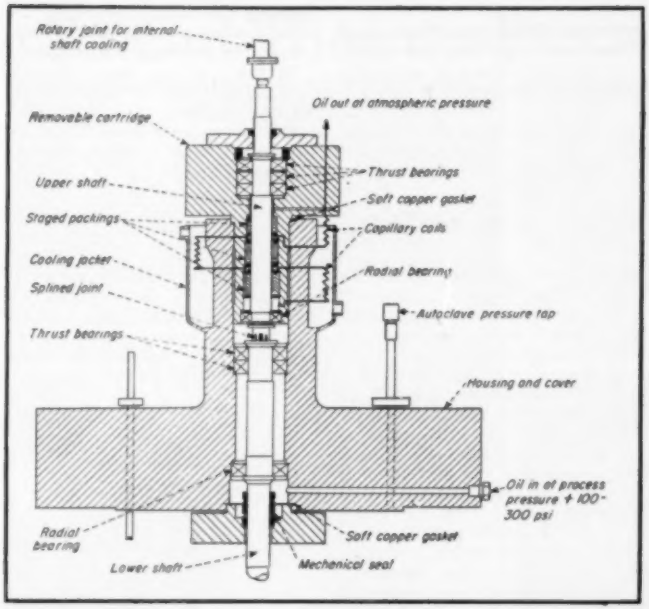


High-Pressure Stuffing Box

Staged packing, with controlled pressure drop across each stage, provides long packing life, minimum shaft wear, and easy maintenance

(187A) Blaw-Knox engineers have developed a new high-pressure stuffing box with staged packing and a pressurized oil system for use with the more highly specialized designs of pressure vessels such as hydrogenation autoclaves operating in the range of 3,000 to 5,000 psi. and 300 to 600 deg. F.

A rotary mechanical seal is provided just where the shaft extends into the reaction vessel, and a suitable oil at a controlled pressure about 100 psi. greater than process pressure is introduced just above the seal. Any leakage through this seal will be toward the process side.

Sealing of oil from high pressure to atmosphere is accomplished by short staged packing sets. In an ordinary long stuffing box using a large number of packing rings, a few rings usually do all of the sealing and, at the same time, cut deep grooves into the shaft. It is desirable, therefore, to have each ring of packing cause an equal pressure drop and exert an equal bearing pressure on the shaft.

This controlled pressure drop across each packing stage is provided by capillary coils through which oil is bypassed from stage to stage. The diameter and length of each capillary is designed to give the desired approximate hydraulic resistance to flow of the circulating oil, the last coil reducing the pressure to atmospheric. For example, if the process pressure is 3,000 psi., oil would be introduced above the mechanical seal at, say, 3,300 psi. The pressure drop across each capillary, and, therefore, across each packing stage, in a three-stage stuffing box, would be 1,100 psi.

The packing used is self-actuated by the applied oil pressure. Oil is supplied by a variable delivery high-pressure oil pump, regulated with a diaphragm air motor. Functioning of the air motor is determined by a controller working from the differential pressure across the mechanical seal.

A water-cooled jacket surrounds the stuffing box. The oil capillaries pass through the jacket, providing for cooling of the oil between stages. Another oil cooler is located at the pump. Oil filters are used at each stage of packing (not shown in drawing) and at the oil pressure pump.

For ease of maintenance, the complete shaft is in two parts, connected by a splined joint. The lower part of the shaft, requiring only infrequent attention, is rigidly mounted on anti-friction bearings in the cover of the vessel. The upper portion of the shaft is mounted on anti-friction bearings in a readily removable cartridge which contains the pressure packing set and the coils of capillary tubing. You can remove this cartridge without disturbing the lower portion of the shaft. For continuous operation with minimum interruptions, a spare cartridge can be furnished.—*Blaw-Knox Co., Process Equipment Dept.*

Time Delay Relay Uses Liquid Silicone

(187B) The new Silic-O-Netic time delay operates on a principle which is said to be new in the field of relays. Instead of a fixed solid core, this relay has a sealed tube which extends through and below the relay coil. This tube, filled with a viscosity-stable liquid silicone, holds a movable iron core. When the coil is energized, the movable core is drawn up into the magnetic field, at a rate of rise controlled by the silicone, introducing a precise time delay.

These relays are available with timings up to 4 min. The manufacturer claims that relay time is not appreciably affected by changes in ambient temperature or position. Over-all dimensions of the relay are 1¾ by 2½ by ¾ in.; rated capacity is 10 amp. at 120 v. a.c.—*Heinemann Electric Co.*

Speed Control For Magnetic Drives

(187C) Precision speed control can now be provided for your adjustable-speed magnetic drive. This control operates through the medium of a tachometer generator, the output voltage of which is proportional to the speed of the drive. This voltage is balanced against a reference voltage as determined by a speed control selector.

Any difference between the operating speed and the desired speed is evidenced by a spread between reference voltage and tachometer output

(Continued)

voltage. This voltage difference, proportional to the error in speed, is applied to the input of a two-stage, self-saturated magnetic amplifier circuit, controlling a selenium rectifier providing three-phase, full-wave rectification. This results in an increase or decrease of magnetic drive excitation current and hence corrects the speed of the driven equipment.—*Electric Machinery Mfg. Co.*

Electrical & Mechanical Briefs

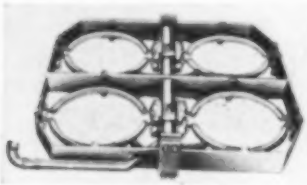
Laboratory Dishwasher—Washes and rinses up to six basketfuls of laboratory ware. Steam or electrically heated. Fisher Scientific Co. *(188A)*

Gear Motor—Doubles the effective torque rating of conventional single pinion and gear units by using two secondary pinions. U. S. Electrical Motors. *(188B)*

Welding Electrodes—Eutechrome 2X for depositing strong, hard overlays to protect surfaces that are subjected to severe abrasive wear. Eutectic Welding Alloys Corp. *(188C)*

Tachometer—Horn centrifugal hand tachometer, made before the war in Germany, again available in U. S. James G. Biddle Co. *(188D)*

NEW AIR HANDLING EQUIPMENT



Bag Filter Blow Rings Are Self-Adjusting

(188E) Bag filters can now be equipped with self-adjusting blow rings which minimize bag wear and chafing. In blowback filters, each bag is circled by a blow ring which travels up and down the bag, flexing it slightly and directing a high-velocity reverse air jet into the bag from all sides. The new blow rings are held snugly in contact with the bags in spite of dimensional changes due to bag shrinkage or stretching.

As shown above, each blow ring is made in two half-sections independently mounted on a common carrier assembly. The half-sections expand as necessary to follow the bag diameter. In addition, the entire blow ring assembly is so mounted that it floats laterally to compensate for possible vertical misalignment of the bag.

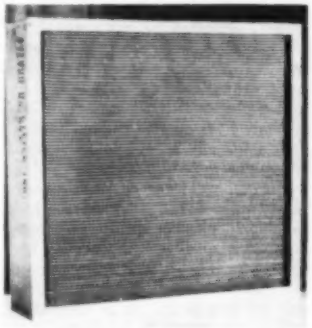
The blow rings are precision aluminum castings, with narrow slots milled in their inner periphery. To minimize damage to bags, the rings are hand finished and polished.—*Turner and Haws Engineering Co.*

Glass-Lined Fume Hood Overcomes Hazards

(188F) A glass-lined fume hood is being used in an analytical laboratory to overcome dangers associated with the use of perchloric acid. This reagent is particularly useful in analytical work, but it reacts on most organic materials to form explosive chlorates or perchlorates. Previously, these deposits accumulated on the inner surfaces of the exhaust piping system as well as in the joints and behind the lining of fume hoods.

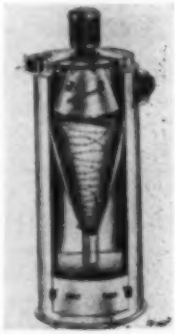
The new hood is a six-compartment unit with each of the six recesses lined with sheets of white Carrara structural glass. The lining is impervious to fumes or deposits and is kept clean simply by wiping with a wet paper towel or cloth. Joints in the glass lining are of silicone rubber, which not only gives a good seal because of its resiliency, but does not react with perchloric acid to form the highly flammable compounds that rubber would yield. For further protection, the silicone is wrapped in Teflon.

Key to successful performance of the new installation is the special water spray equipment in the exhaust piping system. This spray operates continually when the hood's exhaust blower is running. The spray serves as a continuous wash-down system for the exhaust piping, and not only keeps it clean and free from any accumulation of dust and deposit, but also protects the inside of the pipe from corrosive attack. Exhaust piping is made of stainless steel, with lead gaskets.—*Pratt & Whitney Aircraft Div.*



EFFICIENT AIR FILTER

(188G) **Here is a picture of the business end of a highly efficient air filter, first described on p. 105 of our Aug. 1950 issue. Commercial availability was announced this May, p. 192. Made from a specially treated asbestos-containing paper, this filter, it is claimed, will remove 99.98 percent of all measurable particles, including those as small as 0.2 micron.—Cambridge Corp.**



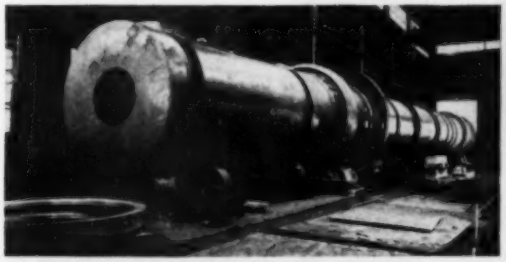
Unit Dust Collector With Separator and Exhauster

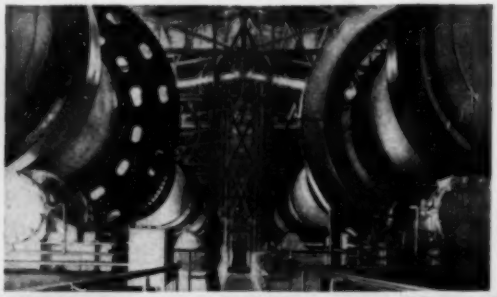
(188H) A new dust collector combines a cyclone separator and an exhauster in a single compact unit. These units should be desirable and practical where central dust control systems are not feasible. They will also serve points too remote to be connected to a central system.

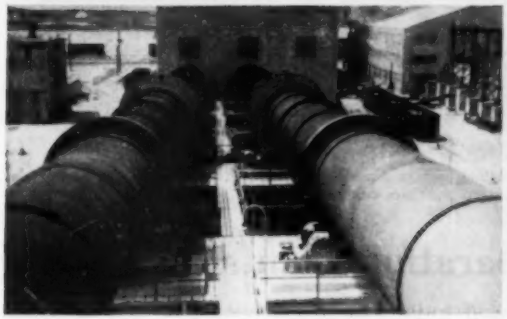
The cyclone dust separator has a two-stage action utilizing internal skimmers. Dust-laden air enters at the side of the unit and spirals smoothly down to the cone outlet. As the cleaned air spirals up through the internal skimmer stack, most of the extra fine dust particles carried upward with the outgoing air are concentrated by the tapered stack. Here they are skimmed off and returned to the dust outlet.

The unit operates at 6 in. external static pressure; the fan can be discharged at any 45-deg. interval. Units are available in four sizes from 500 to 2,000 cfm, and can be furnished with or without secondary filters.—**Day Co.**

Have Your Kiln "Traylor-Made" To Cut Thermo-Processing Costs





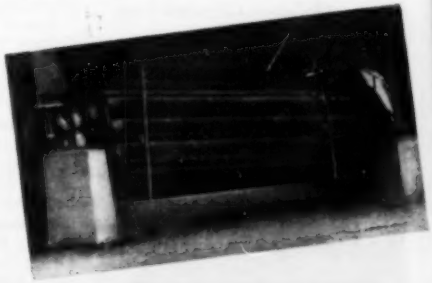


Traylor's individual engineering pays off in greater operating economy . . . better product quality.

In building literally miles of Rotary Kilns, Traylor has seldom built two exactly alike, except for the same customer on the same process. Each one has been "Traylor-made" especially for its particular job.

Diameter; length; type of supports; method of firing; all have a direct bearing on the operating efficiency and quality of product produced by a Rotary Kiln. That's why Traylor engineers make a careful study and detailed analysis of each individual installation before a kiln is "Traylor-made" for the job. Consult with Traylor engineers to benefit by this method of solving calcining problems. There's no obligation.

Rotary Coolers, Dryers and Slakers are also in Traylor's line of process equipment. Traylor Rotary Coolers are built in 3 types; Dryers in 2 types. Traylor Slakers, like the coolers and dryers, employ many of the same construction features that have made Traylor Rotary Kilns the choice of leading Chemical Processors throughout the world. Mail coupon for bulletin 6121.



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Liquid Filter
With Horizontal Plates

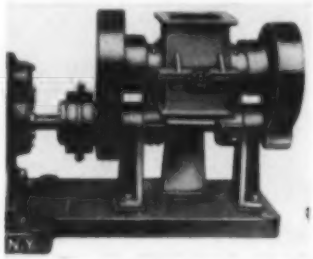
(190A) A new horizontal plate filter uses interchangeable spun metal plates of two depths, permitting a variety of combinations of area and cubic capacities. Effective filtering areas range from 1 to 42.6 sq. ft.—*Hercules Filter Corp.*

Water Chlorinator
Uses HTH Pills

(190B) A new method for chlorinating water uses a specially engineered feeder in combination with high-test calcium hypochlorite in tablet form. The feeder is designed to dissolve the tablets and dispense the resultant solution at rates which can be accurately controlled and quickly varied to cover a wide range of operating demands. It is said to be simple to operate and require very little maintenance.

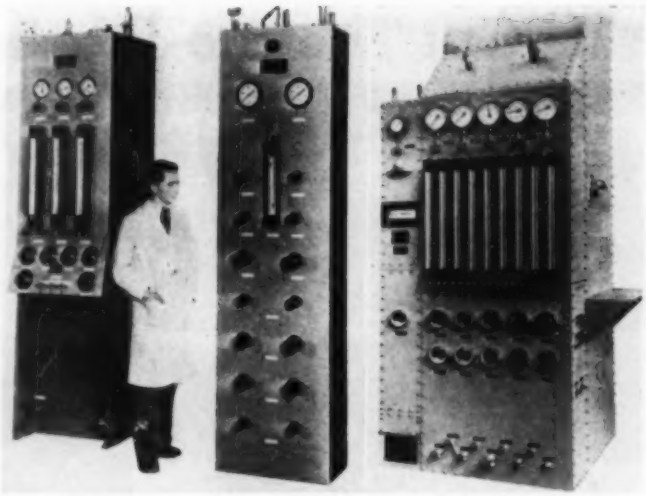
The Hypochlorinator takes water from a high pressure point of a system at a controlled rate and injects it into a tablet bed, providing a chlorine solution which is returned to the system at a point of lower pressure. The body of the unit is made of transparent plastic and is only 17 in. high and 8 in. in diameter.

The tablets, pure compacted HTH containing 70 percent available chlorine with no binder or filler, are ¾ in. in diameter and ¼ in. thick. Each tablet weighs about 1/6 oz. They come packed in 100-lb. non-returnable drums.—*Mathieson Chemical Corp.*



Laboratory Kneader
For Testing Plant Batches

(190C) A new steam-jacketed one-pint kneader can be used for laboratory testing of mixing operations. With sigma blades and tilting action, it is a miniature counterpart of plant-scale kneaders.—*Charles Ross & Son.*



DRYING and separation units of a small liquid nitrogen plant are at the left. At the right is a Type T oxygen plant (see below).

Air Separation Plants

Packaged units will produce oxygen and nitrogen for research and small process uses.

(190D) Small and medium-size oxygen and nitrogen plants are now being manufactured on a commercial scale. These new plants are said to have many highly developed features which provide maximum efficiency, reliability, and economy.

Special attention is paid to air purification in order to prolong the running period before defrosting is necessary. CO_2 is removed by scrubbing with caustic soda solution, and oil and water vapor are removed by adsorption on activated alumina. The particular advantage of alumina is that, while giving high drying efficiency, it can be regenerated in place and lasts almost indefinitely.

Type R plants are designed for supplying 99.9 percent liquid nitrogen for use as a low temperature refrigerant in research laboratories. There are two standard sizes, producing 8 and 24 liters per hr. The plant consists of an air compressor, scrubbing unit, drying unit, precooling unit, and separation unit. The drying and separation units are each suitably insulated and encased in steel housings, with all necessary valves and instruments mounted on their front panels (see cut). The precooling unit is a commercial refrigeration unit consisting of a Freon compressor and water-cooled condenser with accessories.

Type S plants supply 99.5 percent gaseous oxygen for welding and cutting operations. The two standard sizes are 250 and 700 cu. ft. per hr. This plant consists of the same units as Type R, with the addition of an oxygen compressor and a cylinder charging manifold.

Type D plants produce either 99.5 percent gaseous oxygen or 99.9 percent gaseous nitrogen. Rated in terms of oxygen capacity, the two standard sizes produce 1,000 and 2,500 cu. ft. per hr. Larger sizes can be manufactured specially to customer requirements.

These plants are of the high-pressure double-column type. The double column, consisting of one rectification column superimposed on another, with a condenser-reboiler between, produces a high yield of either oxygen or nitrogen, thus giving greater economy in power consumption than the simpler single column plants, while requiring more headroom.

Type T plants produce 7,000 cu. ft. per hr. of oxygen or greater, or the

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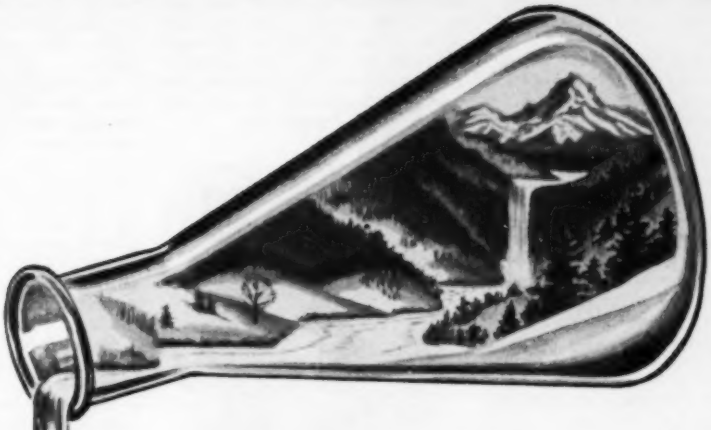


WATER OF MOUNTAIN STREAM QUALITY FOR YOUR PROCESS—AT YOUR DOOR

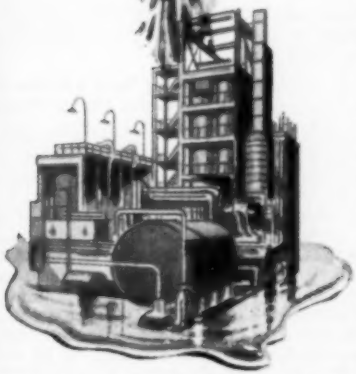
Melting snow, near the source of a mountain stream, gives unusually pure natural water. Nice, if your plant is nearby. But if it isn't, you can still have the water you need for your process, by treating it with AMBERLITE deionizing resins.

Consider this:—Strongly basic AMBERLITE IRA-400 and IRA-410, plus strongly acidic AMBERLITE IR-120 can give you water with a total ionized solids content of less than 0.1 p.p.m. Weakly basic AMBERLITE IR-45 and strongly acidic AMBERLITE IR-120 eliminate metallic cations and mineral acidity, leaving only weak ions in solution. And weakly basic AMBERLITE IR-45 and weakly acidic AMBERLITE IRC-50 reduce total ionized solids substantially —at low cost.

These are only a few of the *many* things you can do with AMBERLITE Ion Exchange Resins—in less time, at lower operating and maintenance cost. For full details of these process-improving resins, write Dept. CEI-6. There's no obligation.

MONOBED
—NEWEST WORD IN ION EXCHANGE

A method of using acidic and basic resins, intermixed in a single unit. With Monobed, highest quality water can be obtained in one pass through one column. Ask for booklet, AMBERLITE MONOBED DEIONIZATION.



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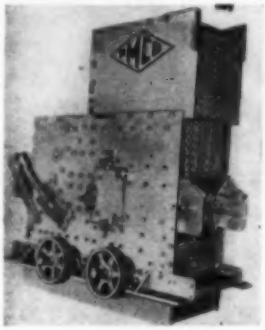
corresponding amount of nitrogen. They are well suited for chemical process work.

In these larger sizes, fixed charges become less important and power costs become more important. Thus, it becomes economical to invest in a more expensive plant in order to get minimum power consumption. This has previously meant splitting of the air supply into very high and low pressure streams, or the use of a reciprocating expansion engine requiring a medium-pressure air supply.

The ideal solution—use of low pressure air only and replacement of the expansion engine by a turbine—has hitherto been available only for large tonnage plants. These Type T plants, however, use a turbine and a single low-pressure (75 psig.) air compressor.—*Petrocarbon Limited.*

Ion Exchange Unit Is Regenerated With Salt

(192A) Latest model of ion exchange unit uses new type resins which are regenerated with plain salt. It eliminates the need for handling such chemicals as caustic soda, sulphuric acid, or hydrochloric acid during the regeneration process. Although employing the same resins as the recently announced mixed bed unit, the resins are segregated in the new double bed unit.—*Permutit Co.*



Heavy-Duty Impact Breaker For Limestone and Phosphates

(192B) A heavy-duty impact breaker, called the PMCO Impact Master, has recently been developed for size reduction of many types of non-abrasive and low-silica content materials, such as limestone and phosphates.

The Impact Master consists of an outer plate steel housing forming a breaking chamber over two rotor hammer members which are mounted in its base. Rotors each have three rigidly supported hammers and rotate on heat-treated alloy steel shafts mounted on anti-friction bearings. Rotor hammers all rotate in the same direction at speeds of 550 to 1,000 rpm., promoting fast feeding and keeping all material constantly flowing toward the discharge.

Size of finished material is governed by the speed of the rotors and by adjustments of a stripper bar and lower screen grate. The latter are protected from damage by tramp iron with automatic return spring-loaded safety devices.

Model 3240 has a capacity of 250 tons per hr. of smaller than 2½-in. on average limestone, using 125 to 150 hp. Other models are available with capacities up to 500 tons per hr. Feed opening is 32 x 40 in.—*Pettibone-Mulliken Corp.*

NEW SAFETY EQUIPMENT

Wheeled Fire Extinguisher With 150 Lb. Dry Chemical

(192C) A new 150-lb. capacity dry chemical wheeled portable fire extinguisher is now available for fighting flammable liquid, gas, and electrical fires. This extinguisher is partially inverted for wheeling, then fully inverted at the scene of the fire, which changes the position of the dry chemical in the tank and thereby provides mechanical breakage. This mechanical breakage feature, plus a continuous nitrogen pressured agitation, provides a fast, effective, and complete discharge. The dry chemical is especially blended for free flow.

You can recharge the unit at the scene—no special tools are needed. Dry chemical for recharging is packaged in handy 50-lb. containers, and spare nitrogen pressure cylinders are readily available.—*C-O-Two Fire Equipment Co.*

FOG GUN FOR GARDEN HOSE

(192D) **This recently developed device, operating on tap pressures as low as 30 psi., will connect to an ordinary garden hose to produce a fire-blanketing fog. The nozzle has instantaneous trigger action and positive shut-off, it is said. It can also be used for such jobs as laying dust, spraying lubricants, and washing coal and gravel.—Bete Fog Nozzle, Inc.**

Mechanical Foam For Polar Solvent Fires

(192E) Aer-O-Foam 99 is a new liquid mechanical foam for extinguishing polar solvent fires as well as non-polar petroleum products fires. It can be used with existing mechanical foam making and proportioning devices. It has been tested successfully on fires fueled by alcohols, ethers, and esters, giving a stable foam which is not readily broken down or disintegrated.—*National Foam System, Inc.*

Wide Angle Sprinkler Head Used in Fixed Piping Systems

(192F) A recently developed new fire extinguishing head is known as the T-Head. Designed for use in fixed piping systems, it has a directional wide angle, medium velocity discharge, and is installed in a pendant position. It is recommended for automatic as well as open deluge use.

It has a full-sized opening for the discharge of water. The design of the T-Head breaks up the water into a fog pattern fine enough to fill the area from the ceiling down to the floor.—*Rockwood Sprinkler Co.*

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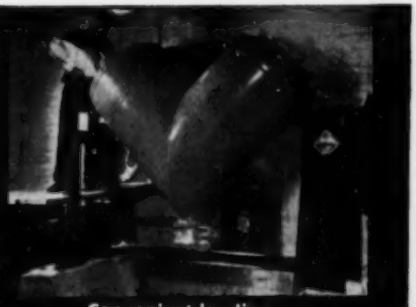
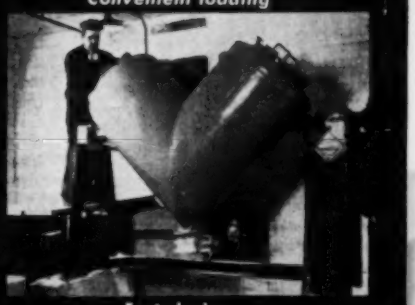
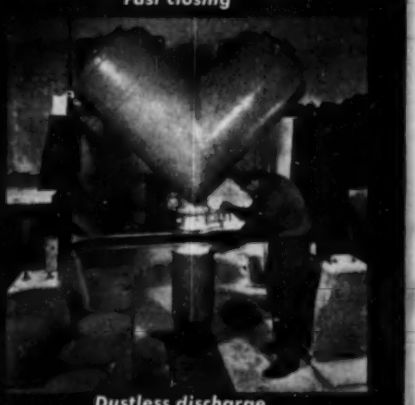
Ends Powder Caking for DAVIES-YOUNG



Convenient loading



Fast closing



Dustless discharge

For some time, Davies-Young's detergent, "Dy-Sulph," had been produced in a small way in a ribbon blender. Disadvantages of that method were two-fold: the blender was too small and the blended powder had a tendency to cake. One of their suppliers recommended a **p-k** Twin Shell Blender* as the most satisfactory way of overcoming both difficulties.

Today, production has been materially increased, the powder is perfectly uniform, with the caking factor eliminated. Cleaning is simplified by the baffle-free design of **p-k** Blenders —loading and unloading time has been reduced. **p-k** Twin Shell Blenders mix dry materials faster and to greater uniformity than any other blender. Production units have a capacity range of from 1 to 250 cubic feet and operate at speeds from 6 to 29 rpm.

You will want to know more about the uniformity and increased production obtainable with **p-k** Twin Shell Blenders—send for catalog 401 on production models and catalog 402 on laboratory models. **p-k** will be pleased to run a test blend of your materials to demonstrate the outstanding merit of this new but service-proved method of dry blending.

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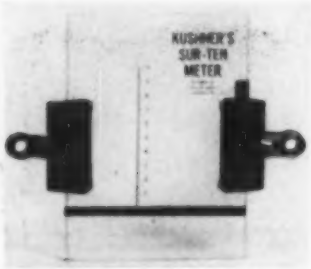
East Stroudsburg, Pennsylvania

1005



Surface Tension Meter Is Easy to Use

(194A) The Sur-Ten meter, an instrument for rapid determination of surface tension, is about as easy to use as a thermometer or hydrometer. It consists simply of two accurately fitted glass plates held together at a very small fixed angle by means of a stainless steel wedge and removable clamps. The two plates are readily separated by opening the spring clamps.

Printed with ceramic enamel on one of the plates is a fixed horizontal liquid level line and a vertical scale marked off in millimeters and centimeters. When the two plates are immersed in the liquid to be tested up to the level line, the liquid will rise by capillary action in the form of a rectangular hyperbola. The point where the curve cuts the vertical scale is a measure of the surface tension.

The instrument is calibrated with any liquid of known density and surface tension, distilled water usually being most convenient. This calibration determines K in the equation

$$S = Kyd$$

where S is the surface tension, y is the height on the scale, and d is the density.

The meter is said to be accurate with ordinary routine control measurements to within 5 percent, and with care, to within 2 percent.—*Joseph B. Kushner Laboratories.*

Low-Range Tester Features New Improvements

(194B) Recent improvements have added to the usefulness and accuracy of the Dillon low-range tester. This machine is used to conduct tensile, compression, transverse, and shear tests on such materials as cloth, paper, ceramics, adhesives, plastics, and fibers.

The machine can now be used up to 300 lb., whereas the previous top range was 100 lb. A solid shaft, replacing the former flexible shaft, provides a more positive and accurate setting of speeds without danger of overruns. Other improvements have been made in the motor drive, quadrant arm, speed control dial, mounting, and finish.—*W. C. Dillon & Co.*

Three-Position Indicator Operated Electrically

(194C) Based upon a similar device used as a landing gear position indicator in aircraft, a three-position indicator is now available for industrial uses. The indicator consists of a rotating card which shows one of three printed symbols at a round observation window in one end of the instrument. The card is rotated by either of two solenoids which draw it up or down to either of two extreme positions. When neither coil is energized the spring-balanced cylindrical card returns to neutral position, showing the third symbol.

The solenoids which control the cards can be actuated by any of a variety of commonly used float, pressure, or contact switches in a simple wiring circuit. Symbols on the card can be designed to meet the requirements of the job.

The compact indicator body, weighing slightly under 2¼ oz., is built to function satisfactorily under adverse physical conditions. The sealed brass case is said to be impervious to dust, and will pass rigid salt spray and immersion tests. It can be filled with inert gas if required.—*Riverside Metal Co.*

Dial Thermometer Can Be Read From Any Angle

(194E) A new development in mercury-actuated dial thermometers is one whose stem can be installed in whatever angle is most convenient and whose dial can be made to face the most convenient position for reading. In addition, the dial can be rotated so that the calibrated scale will always be in the proper vertical position. The manufacturer guarantees these thermometers to be accurate to one scale division.—*Palmer Thermometers, Inc.*

Electronic Flow Integrator Provides Rapid Scanning

(194F) Electronic integration has been incorporated into a new flowmeter. It provides a rapid scanning rate which makes the meter especially useful for conditions of low flows or rapidly changing flows where ordinary integrators are not very accurate.

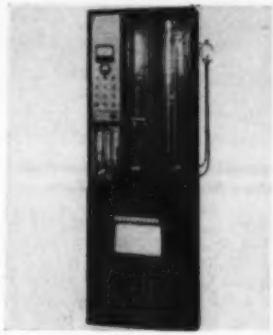
The entire integrating mechanism comprises but three major assemblies —a scanning unit which checks the flow rate 12 times per min., an electronic detector relay, actuated by the scanning unit and operating the counting mechanism, and a motor-driven counter assembly to totalize the successive output impulses from the detector relay.

Use of an electronic scanner eliminates the usual load on the flowmeter pen. The unit comprises a lightweight vane that is positioned by the pen through a mechanical linkage, and

TWO INSTRUMENTS CONTROL HEAT INPUT TO FOUR STILLS

(194D) The pair of instruments seen at the far left, supplied by Weston's Tagliabue Div., control the heat input according to a set program to four experimental varnish stills in Socony Paint Products laboratory. Ordinarily four pairs of controllers and program units would be required. In this setup, however, the controller includes a four-point potentiometer and the program unit contains a cam which is switched periodically from one point to another.—Weston Electrical Instrument Corp.

dual oscillator coils mounted on an arm driven by a precision-made cam. When the leading edge of the vane is intercepted by the coils, the detector relay is energized and the counter motor is permitted to operate.—*Minneapolis-Honeywell Regulator Co.*



Gas Analyzer Fractionates by Adsorption

(195A) Details on a new method for rapid and accurate analysis of light hydrocarbon gases have recently been made public. The new method is based upon adsorption fractionation.

Gases are separated by adsorption and identified by measurement of their thermal conductivities. The volume of each fraction is arrived at by determining the change in pressure of an evacuated system. Accuracies of the order of 0.2 percent are claimed. Identifications and measurements of the gas fractions are recorded on a potentiometer so that a complete and automatic record of each analysis is available.

An electrical connection is the only requirement for immediate operation. No liquid air or other refrigerants are required.—*Burrell Corp.*

Temperature Control Uses a Pilot Air Valve

(195B) Model HA, a new pneumatic temperature control, uses a pilot air valve instead of the Micro switch used in previous models. The air valve handles 15 psi. air pressure directly, sufficient to operate a diaphragm valve or motor. The new instrument can be used in locations where an electrical instrument would be hazardous.

The instrument is actuated by thermal expansion of a tube, the magnitude of expansion being multiplied many times by an appropriately designed lever. Only a very small motion is required to move the pilot valve

(Continued)

A MIDWEST CHEMICAL CO.

saves

$112,500

annually

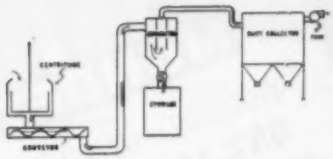
salvages

600,000 lbs.

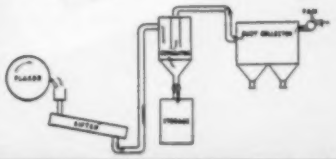
of chemicals

with

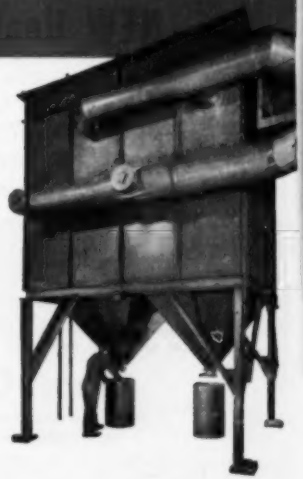
Two complete Dustube Dust Control systems are used to eliminate dust nuisances in this midwest chemical plant*. In one system about 25,000 lbs. of very fine material is handled daily. From 5% to 7% of this escapes preliminary separators and is trapped in a Dustube. Worth 15c a pound, a minimum of $187.50 is saved each day.



In the second system which ventilates chemical processing stations, a minimum of 750 pounds of valuable material is recovered each day with a Dustube. At 25c per pound, the product recovered daily has a value of $187.50.



DUSTUBE
DUST CONTROL



The two Dustube Collectors installed at this chemical company have paid for themselves many times over with their thorough dust removal. Dustube's highly effective filtering action traps even the finest dust with virtually 100% efficiency. Its simple, practical design provides the highest efficiency at the lowest cost.

Let Dustube engineers show you why users everywhere say: "It pays to own a Dustube." *Write today for full information.*

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dustube
COLLECTORS

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MUNDET 85% MAGNESIA INSULATION provides maximum strength and resistance to vibration. Extra durability is built into this insulation. In pipe covering and blocks, it is precision manufactured on the latest type of automatic equipment to insure uniform standards. It does not "powder", settle or disintegrate. It is unaffected by steam or water leakage. It maintains an attractive, smooth finish. Precision pipe fit is assured, with no spaces left for the escape of heat. You benefit from the most modern manufacturing facilities for the production of heat insulation when you specify Mundet 85% Magnesia Pipe Covering and Blocks.

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DETROIT 31 24401 Prairie Ave.
HOUSTON 1 Commerce and Palmer Sts.
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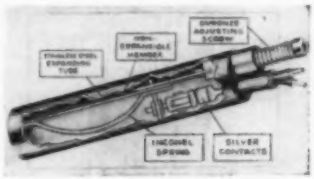
INSULATION FOR HIGH & LOW TEMPERATURE

from fully open to fully closed position, according to the manufacturer. —*Burling Instrument Co.*

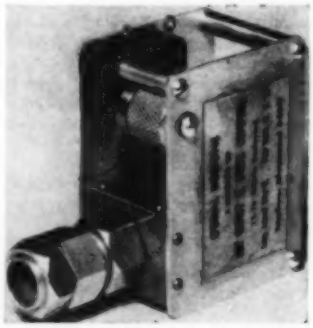


Expanding Tube Thermostat Makes Full Use of Alloys

(196A) An expanding tube thermostat of new design has been announced by the Smith Control & Instrument Corp. The new model utilizes a stainless steel tube as the expanding member and an Invar strip as the non-expanding member. An Inconel spring gives fast make-and-break action.

A Duronze adjusting screw permits quick and easy setting of the control point at any temperature up to 600 deg. F. Massive silver contacts provide two breaks in series, for long life.

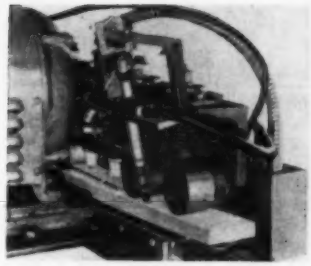
The new thermostat is made in three types for conduction, convection, or immersion. Capacities range up to 1,000 w.—*Smith Control & Instrument Corp.*



Air Flow Switch Features Extreme Sensitivity

(196B) A new pressure switch for protecting processes and equipment against failure of air flow will operate on a minimum static pressure of 0.2 in. water gage. This extreme sensitivity is made possible by the use of a vane traveling in a duct which actuates a sensitive snap action switch.

Known as Cat. 113, this switch is designed to operate a control relay in event of stoppage of air flow due to any cause. It is rated at 5 amp. at 250 v. a.c.—*Henry G. Dietz Co.*



MARKS WET LUMBER

(197A) An electronic detector, actuated by a moisture-sensitive probe, marks excessively wet lumber with red ink. Developed by the Plywood Research Foundation, this versatile new device can be adapted to virtually any manufacturing process where moisture is a problem. —Laucks Laboratories.

Air Pollution Meter Records and Integrates

(197B) The Thomas Autometer, for automatic analysis of air pollution by SO_2, is available as either an integrating or non-integrating assembly, complete with Speedomax electronic recorder. Range of the instrument is 0 to 5 ppm. Changes in concentration as small as a few tenths of a ppm. can be readily detected, it is claimed.

This instrument operates on the principle of electrolytic conductivity. A continuous sample of air is passed through a solution which absorbs SO_2, causing a measurable change in the conductivity of the solution. These changes are noted by the Speedomax.

The integrating Autometer continuously records actual concentration of SO_2, records average concentration integrated over a half-hour period, automatically checks its zero reading every half hour, and marks off each cubic foot of air sampled. The non-integrating assembly is of simpler design, providing only the continuous record of concentration.—*Leeds & Northrup Co.*

Geiger Counter—For infinite life under conditions of high ambient temperature. Water-cooled, filled with argon, xenon, oxygen, and nitrogen. Radiation Counter Laboratories, Inc. *(197C)*

Metal Detector—Four types of small-aperture inspection heads. Products pass through apertures on conveyor belt or chute at 10 to 1,000 fpm. Radio Corp. of America. *(197D)* —End

Bulletin Describes Benefits from New High Speed Mixer

***Homogeneous Mixing Now is Obtained in* Faster Time . . . at Less Cost . . . with the "ENTOLETER" Mixer.**

The "ENTOLETER" Mixer is a new-type centrifugal machine designed to provide thorough mixing and blending . . . in faster time . . . at reduced cost. In actual manufacturing operations in the chemical process industries, this equipment is producing amazingly uniform mixtures, simply and economically.

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The "ENTOLETER" Mixer produces a finished mixture at rates up to 250 pounds per minute. Where ingredient percentages in a formula are sufficiently large to allow accurate metering, a truly continuous operation is achieved.

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The "ENTOLETER" Mixer is easily incorporated in the processing system as a final mixer. It serves to shorten mixing time, with consequent savings and appreciable improvement in product quality.

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The "ENTOLETER" Mixer requires only 12 cu. ft., with capacity of 12,000 lbs. of finished mix per hour. This equipment destroys all stages of insect life where beetle or similar insect infestation may be present. Mail coupon today for full description.

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Vinyl Trichlorosilane

Its reactions, unique among the organosilicons, promise a bright commercial future as a chemical building block. (198A)

Linde Air Products has a dark horse in its new products stable—vinyl trichlorosilane. Judging from the industries in which it has stirred up research activity, possibilities for its commercial applications are numerous and many-sided. Petroleum, rubber, plastics and textile researchers are all working to exploit its properties in their respective fields.

Although only one commercial application of the compound has thus far been made public, Linde feels able to predict for 1952: major expansion of sales; commercial acceptance in a number of industries. For the present the compound is being made on a 100,000-lb.-a-year semi-plant scale at the company's silane-silicone plant in Tonawanda, N. Y.

The eye-catching chemical reactions of vinyl trichlorosilane are: (1) The Si-Cl groups are readily converted to other groups like Si-O-, Si-N-, and Si-S-. These reactions generally result in the formation of polymers, the most important being the silicones. (2) Reactions can be carried out through the vinyl group, either prior to the formation of the polymers or subsequent to it. It is this second type of reaction which is relatively new to organosilicon chemistry, placing vinyl trichlorosilane in a position of unique importance.

The one commercial application which has been fully developed and publicized is moisture-proofing of laminates made of glass fiber and plastics. The Air Material Command at Wright Field had been worried over the way the laminates lost strength when they got wet. They turned the problem over to Bjorksten Laboratories researchers who reasoned that water was actually getting between the glass and the plastics since there was no actual chemical bond between the two. What they needed was a molecule that could be chemically tied to the glass on one side and the plastic on the other—vinyl trichlorosilane's double bond did the trick admirably. In recent months several other companies in addition to Linde have been working to adapt these findings to an acceptable plant process. Such a process now seems assured.

Reactions involving hydrolysis of the chloride groups and condensation to form polysiloxane resins follow the same pattern as do the alkyl trichlorosilanes. Chlorine is replaced with hydroxyl groups by hydrolysis followed by condensation to give Si-O-Si linkages with the elimination of water. Condensation is achieved by heating or by using certain catalysts and can be controlled to yield either liquid or solid polymers. Although polymers formed from vinyl trichlorosilane do not have quite the thermal stability of other polysiloxane resins, copolymers of this material with alkyl or aryl silanes have been found to possess good thermal stability and rapid curing properties.

Vinyl trichlorosilane has been copolymerized with a number of unsaturated organic compounds, including materials such as ethylene, propylene, isobutylene, vinyl acetate, and styrene. The products formed by these reactions have not been fully characterized or explored.

Physically, the compound is a colorless fuming liquid. It has a molecular weight of 161.48, boiling range of 88 to 91 deg. C, is soluble in most organic solvents. Its refractive index at 20 deg. C. is 1.436.

Antioxidant

Finding a place in the rubber, petroleum and textile industries. (198B)

Ton lots of Antioxidant 2246 are now being sold by American Cyanamid. A stable, white crystalline powder, its chemical name is 2, 2¹-methylenebis (4-methyl-6-tertiarybutyl phenol).

It is not a general utility antioxidant for all types of rubber. Rather, it has been designed to fill a need in light-colored rubber goods where other antioxidants cause severe discoloration. In addition, it serves as an antioxidant for rubber used in places where staining of enamels and paints is a problem.

The evaluations of Antioxidant 2246 in various petroleum fractions, although not yet completed, are promising. Small percentages in paraffin wax satisfactorily stabilize the wax for long periods preventing odor and color formation. In addition, the stabilization of certain fuels and lubricants is adequately accomplished at a cost competitive with other antioxidants.

The textile trade uses large quantities of natural fats and oils in finishing. These products are unstable under certain conditions of treatment and may be stabilized with Antioxidant 2246.

Although Antioxidant 2246 is said to be technically satisfactory to stabilize food lard and vegetable oils, it has not been submitted for the approval of the Food and Drug administration and therefore cannot be recommended for these uses. Other possible applications extend to paints, soaps and fish oils.

Phosphate Coating

Corrosion-resistant paint base for metals. (198C)

A new phosphate compound for treating metallic parts is now being produced by Octagon Process, Inc., Staten Island, N. Y. Known as Anchorite 100, it gives uniform results and is one of the few pre-painting treatments that meets the specification for a Class C (Type II) finish in U. S. Army Spec. No. 57-O-2C. It also meets the armed services specification JAN-C-490, Grade 1, and has been used on military equipment on which paint failure cannot be risked.

The phosphatizing action of Anchorite 100 changes the surface of steel, iron, zinc and cadmium parts into an inert phosphate compound which is highly resistant to corrosion, and which provides an excellent base for organic coatings. One of the chief causes of paint destruction on ferrous parts is that steel does not have a chemically uniform surface, causing galvanic corrosion between the different elements making up the steel. This breakdown produces an alkaline medium which attacks the paint film from beneath the coating. Since the Anchorite 100 surface in non-conductive, electrochemical breakdown cannot occur; the phosphate compound acts as an insulating barrier between the metal and paint.

Application of the Anchorite 100 phosphate treatment to metal parts requires no elaborate equipment. Applicable either by immersion or spray, it can be adapted to both small and large production needs. The immersion process, which is most widely used, usually utilizes a series of five tanks constructed of mild steel. Zinc and cadmium require only 30 seconds to one minute in this process, while

some steel alloys occasionally require as much as five minutes. The Anchorite solution is made by adding a small quantity to a large volume of water; thus its use is very economical.

Anchorite phosphate treatment eliminates another source of paint failure—corrosion due to accidental scratching or chipping. The new coating limits the corrosion to the exposed area.

Although the coating receives largest volume application on ferrous parts, it is also finding acceptance as a pre-painting treatment on such metals as zinc, galvanized iron, and cadmium. The adhesion of organic coatings directly on these surfaces is notoriously poor; an Anchorite 100 treatment provides these metals with a paint-adherent, corrosion-resistant phosphate surface. It also affords protection when no organic coating is applied over it.

IN BRIEF—A capsulated listing of this month's newsworthy products

It's New . . .	It's Good For . . .	See Page . . .
Vinyl Trichlorosilane	Bonding agent for glass-plastic laminates	198A
Antioxidant	Avoiding stains on light-colored rubber goods	198B
Phosphate Coating	Pre-painting ferrous parts, zinc, galvanized iron	198C
Phenolic Resin	Liquid core binder: faster baking cycles, stronger product	199A
Resin Cement	Corrosion resistant adhesion to concrete and metals	199B
Rust Preventative	Addition to oils and waxes to protect metal surfaces	199C
Porcelain Enamels	Combatting heat corrosion of heat exchangers, mufflers	199D
Anti-Corrosive	Metal cleaning and protection	199E
Five Stannates	Heat and rust resistance	201A
Varnish	Resisting temperatures up to 500 deg. F.	201B
Preservative	Preservation without refrigeration of meat, fish	201C
Adhesive	Waterproof bonds, set at room temperature	202A
Dimethoxy Tetraethylene Glycol	Selective solvent duty in purifying acetylene, SO_2	202B
Vinyltoluene	Replacing styrene in paints, plasticizers, rubbers	204A
Optical Whitening Agents	Giving soaps and detergents more whitening ability	206A
Wax Ester	Manufacture of lubricants, greases, plasticizers	206B

Don't Forget: Reader service postcard inside back cover will bring you more information. Use these key numbers.

Phenolic Resin

Used as a core binder, adds speed to operation and strength to product. (199A)

An improved liquid phenolic core binder resin especially formulated to meet critical foundry requirements has been developed by General Electric's chemical division. Designated as G-E 12353, the resin permits the molding of stronger sand cores than was possible with former phenolic resins, and it has higher water diluteness and improved handling characteristics. Through its use, baking cycles are reduced to about half the time required for conventional vegetable or petroleum-base core oils.

To use G-E 12353, it is first mixed with water and then mulled thoroughly with sand. After ramming or blowing the treated sand into the core boxes, the molded core is removed and baked. Finally, the core is ready for pouring.

The resin can also be used as a spray when diluted with four parts of water to increase the hardness of oil or resin bonded cores. The spray penetrates cores to a depth of about ¼ in. and the hard shell which results resists penetration of metal and also protects the cores from breakage in handling.

Resin Cement

A corrosion resistant, versatile adhesive. (199B)

Atlas Mineral Products has announced the availability of Alfane, a light colored synthetic resin cement. The company reports that in addition to being resistant to most acids, salts, solvents and greases, it has excellent resistance to all alkalies.

Unlike other resin cements, Alfane is said to set hard in contact with concrete and metals.

Rust Preventative

For addition to oils and waxes used to protect metal surfaces. (199C)

Due to its inherent polar activity, Petrobase 210, used in small quantities, causes petroleum oils, petrolatums and waxes to displace preferentially water from metal surfaces. This property also prevents redeposition of aqueous vapors or liquids on the metal surface. The manufacturer, Pennsylvania Refining Co., states that the physical chemical mechanism controlling this displacement and repulsion of water provides double-barreled protection against the most common causes of rusting.

Pennsylvania Refining recommends it for humidity protection in the following four types of service: (1) Government specification preservative oils and compounds. (2) Industrial preservative or slushing oils. (3) Household oils used for lubricants for small motors, hinges, tools, appliances, etc. (4) Water displacement fluids which selectively "wet" metal surfaces causing a thin oily film to be deposited on the surface for rust prevention and finger print suppression.

Heat-Resistant Porcelain Enamels

Can replace critical materials in many applications by solving heat corrosion problems for defense products. (199D)

Several types of porcelain enamel coatings have been developed for use where continued exposure of metal parts to high temperature necessitates protection against corrosion (exhaust pipes, mufflers of internal combustion engines, heat exchangers and other parts exposed to high temperature gases). Often porcelain enameled steel can also cut initial costs by enabling reduced thickness or the replacement of more expensive metal, according to the Porcelain Enamel Institute.

Firing temperature of the enamel can be varied so that coatings are suitable for low-carbon steels, stainless steels, and alloy steels such as Inconel; this type of coating generally matures at around 1,600 deg. F. Porcelain enamel coatings also have been developed which can be fired at temperatures as high as 1,900 deg. F. They have been used successfully on gas turbine combustion chambers.

Anti-Corrosive

For boiler and metal protection. (199E)

Four grades of Corrosanti for various metal cleaning and protecting purposes are ready for national distribution by Dr. Adolph Schror, East Orange, N. J. Packaged in 5-gal. containers, the grades are designated A, B, C and Special.

Grade A removes boiler scale when injected into the boiler through the feed line. It also prevents electroylsis within the boiler and is harmless to valves, pumps, gaskets and other equipment.

Grade B is a rust inhibitor for ferrous metals subjected to deteriorating influences of water and water vapor (water tanks and towers, underground piping, open air condensers etc.).

Grade C is designed for protection of metal surfaces subjected to acid and other highly corrosive vapors, gases, acid-forming conditions, salt water, and brines.

"Lift-up powder" for tired oil wells

How Celite filtration helps boost oil output

TO BOOST THE OUTPUT of "tired" oil wells bordering on the limit of economic production, profit-conscious operators inject water under extreme pressure into the porous oil sandstone and force out the accumulated oil. But first, they filter this repressurizing water with Celite® to remove the suspended solids which would eventually clog the microscopic pores of the sandstone, thus blocking the flow of water. *All waters contain at least a trace of these troublesome impurities.*

Celite's ability to do an exceptional filtering job can be attributed to these important factors which make it unique among filter aids:

Carefully processed from the purest deposit of diatomaceous silica known, Celite is available in nine standard grades—each designed to trap out suspended impurities of a given size and type. Whenever you reorder, you are assured of the same uniform, accurately graded powder received in your initial order. Thus, with Celite, you can count on consistent clarity in your filtrates—at highest rate of flow—month after month, year after year.

The secondary recovery of oil by water flooding is just one of many processes in which Celite has provided the absolute clarity vital to a successful operation. The proper grade of Johns-Manville filter aid will assure you the same results—regardless of the product or process involved. To have a Celite Filtration Engineer study your problem and offer recommendations, simply write Johns-Manville, Box 290, N.Y. 16. No cost or obligation.

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JM PRODUCTS

Johns-Manville CELITE

FILTER AIDS

Special is designed for ferrous surfaces subjected to temperatures of 900 deg. F. such as smokestacks, boiler fronts, flues, uptakes, etc.

Five Stannates

Produced by precipitation for uniformity of composition. (201A)

Barium, calcium, magnesium, lead and bismuth stannates are now being manufactured by Metal & Thermit Corp. in addition to potassium and sodium stannates. The company is producing pilot plant and experimental quantities by precipitation, which it is claimed, provides close manufacturing control and uniformity of composition.

Properties of stannates as ingredients of ceramic capacitor bodies, dielectric and piezoelectric bodies, special glasses and color stains have been under investigation by the M & T ceramic research laboratory for some time.

Varnish

Heat and rust resistant. (201B)

Raymond C. Crippen, Research & Development Laboratories, Baltimore 2, Md., announces the development of a clear varnish capable of resisting temperatures up to 500 deg. F. It air dries quickly to a hard, rust inhibiting and flexible finish.

The coating has found application on brake shoes where a clear finish is desirable prior to baking on the brake shoe linings. The finish does not discolor under the heat required to bond the brake linings.

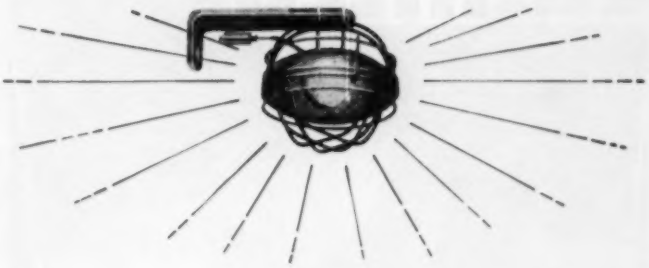
Preservative

Retards growth of bacteria that cause spoilage in food, flowers. (201C)

Noe-Ice, for preserving fish, fowl and game without refrigeration for two or three days, is now being nationally distributed by Noe-Ice Sales Corp., Los Angeles. Principle of Noe-Ice is that it "preserves freshness because it retards growth of bacteria that cause spoilage . . . yet does not alter taste in any way." It does not penetrate but forms a coating or kind of seal over foods. Its ingredients—sodium benzoate and chloramine T in a base of sodium chloride.

Among commercial possibilities, Noe-Ice can boast of keeping roses fresh for seven days without refrigeration, thus saving shipping costs. In one experiment, a 16-day shipment of spinach via ship to Hawaii arrived

(*Continued*)



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fresh and unwilted. Easily-spoiled fresh-cooked Dungeness crabs were flown from Portland, Ore., to Mexico City without spoilage. Shipping time —more than 36 hours without refrigeration.

Another valuable quality of the product—it kills odors. Rub a slice of onion on your hand, then spray with Noe-Ice solution. Result: no odor. Spray a sliced onion, set it next to the butter in an ice box, and no odor will saturate the butter.

Adhesive

Sets at room temperature. Uses 40 percent less of scarce resorcinol. (202A)

Penacolite Adhesive G-1260 is a two-component resorcinol-phenol-formaldehyde resin adhesive, capable of curing at room temperature and providing strong, durable, waterproof bonds. Despite the low resorcinol content, it has passed the stringent test of the armed forces specification JAN-A-397. It is available from Koppers Co. to all who can qualify under present government regulations.

Its two parts are a liquid resin, G-1260-A, and a powdered hardener, or setting agent, G-1260B. The former is an alcohol-water solution of a partially condensed phenol-resorcinol-formaldehyde resin; the latter is a tan powder made up of para-formaldehyde and walnut shell flour.

Essentially neutral and inert, the product is recommended for use between wood, treated woods, many plastics, natural and synthetic rubbers, primed metals, and porous materials such as paper, leather textiles, plaster, cement, fiberboards and asbestos boards.

Dimethoxy Tetraethylene Glycol

Good reaction medium for the sodium condensation and Grignard reactions. (202B)

A recent addition to the list of specialty Ansul chemicals now available in pilot plant quantities, is dimethoxy tetraethylene glycol. It is a colorless, high boiling ether of high purity.

A versatile chemical, it has the unique property of being miscible with both water and organic solvents such as benzene, toluene, ethanol, diethyl ether, etc. Solvent power may be altered by proper dilution with water or hydrocarbons. In common with all ethers, dimethoxy tetraethylene glycol is subject to peroxide for-

(Continued)

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Heyden's leadership in the chlorination of toluene and the production of chlorinated aromatics dates back more than a quarter of a century. Research chemists and production engineers will want to investigate the chloro derivatives of benzyl chloride in syntheses similar to those mentioned above. Typical of other interesting and useful Heyden chlorinated products are the chlorobenzoyl chlorides and the ortho-chloro derivatives of toluene, benzaldehyde, benzotrichloride and benzoic acid.

Write now for samples and further information.

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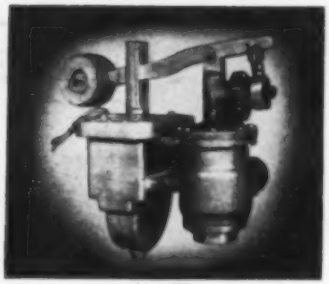

No. 97

Here is a valve with many outstanding features for long, trouble-free operation in severe service. Valve stem is connected to solenoid lever through Davis' exclusive "Dia-Ball" packless joint. Simple valve interior and large port areas make this unit self-cleaning. Explosion proof housing, isolated coil, renewable valve disc and visible action all add up to make the Davis No. 97 safer, more efficient and more economical.

No. 93

Davis No. 93 is a self-contained, pilot operated, single seated, tight closing valve, built with full port opening to insure maximum flow with minimum pressure drop. Action is visible—may be operated by hand if current fails. Renewable valve disc. Sizes ½" to 4". Suitable for control service on steam, air, gas, water or oil lines.

DAVIS Solenoid Valves are engineered to handle your toughest control jobs. Don't confuse them with ordinary commercial types. Davis guarantees satisfaction! The Davis Solenoid line is complete—standard and special designs are available for many different kinds of control applications.

The Davis engineering department is always ready to help you solve any problems regarding the use of solenoid valves. When you submit your problem, give us complete information so that the proper valve may be selected for the service. State the size of valve, pattern (globe or angle), nature of fluid or gas, temperature, maximum and minimum pressures, service use, whether valve is to be open or closed when energized, standard or explosion proof solenoid box and current characteristics.

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Complete details and specifications on Davis' complete line of solenoid valves. Includes information on operation, applications and valves recommended for various kinds of service.

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mation on exposure to air. If the material is to be distilled, it is recommended that the solvent be tested and any peroxides destroyed. Any specified peroxide inhibitor can be added on request.

The fact that dimethoxy tetraethylene glycol has no active hydrogen makes it very useful as a reaction medium for the sodium condensation and Grignard reactions. It is an excellent selective solvent and has been used to purify such gases as acetylene, sulphur dioxide, etc. The material has been tested successfully as an additive to hydrocarbon diesel fuels to reduce the auto-ignition temperature of the fuel for cold starts.

Ansul has been licensed by the Eureka Williams Corp. to manufacture dimethoxy tetraethylene glycol. Under this agreement, Eureka Williams retains the exclusive rights to the material in the refrigeration and air conditioning fields.

Quantities up to single drum lots are available for immediate delivery. Larger quantities will be available by late 1951. Current price is $1.10 a lb. in 55 gal. drums.

Vinyltoluene

A styrene substitute made from ethylene and toluene offers relief from the benzene shortage.

(204A)

Pilot plant quantities of an isomeric mixture of m and p-vinyltoluenes are now being produced by Dow Chemical Co. The purity of this monomer as produced is more than 99 percent. Vinyltoluene of this purity can substitute for styrene in paints, varnishes, plasticizers, rubbers, polymers, latices and resins. It is even reported to be superior to styrene in the paint and varnish fields.

Comparing the properties of this new monomer to styrene: its polymerization rate is twice as great; its vapor pressure is substantially lower. Experience to date concerning handling and storage (other than distillation) is similar to styrene. In fact the same concentration (10 ppm.) of o-tertiary-butylcatechol is used as inhibitor in the purified vinyltoluene.

Here's the way Dow sums up the benzene-saving aspects of its new commercial process for the monomer. Vinyltoluene utilizes ethylene and toluene as raw materials, both of which can be abundantly produced from petroleum products. It is well known that toluene can be produced more easily and cheaply from petroleum and natural gas hydrocarbons than benzene. Known refinery processing

(Continued)

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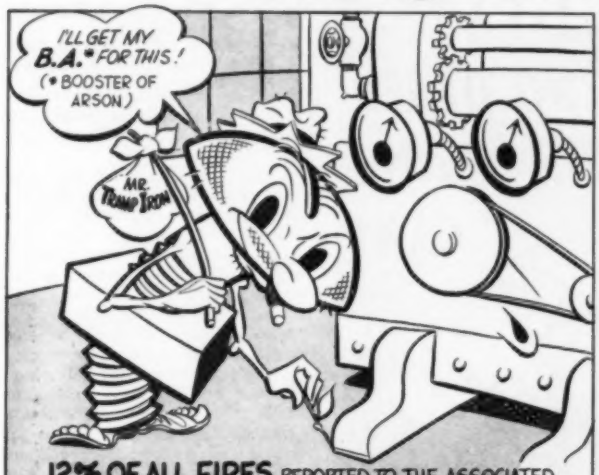

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can make three to four times as much toluene per barrel of oil as benzene. Already large amounts are being produced by the hydroforming process, one widely used by the petroleum industry. Thus with existing coke oven toluene and synthetic toluene plant capacity (built during World War II) toluene can become more plentiful than benzene.

Optical Whitening Agents

Helps soap and detergents make white fabrics whiter. (206A)

Colorless, fluorescent, direct dyestuffs known as Antara Brighteners have been developed by General Aniline & Film Corp.

Their chief value lies in their ability to whiten washed fabric when applied through the medium of soap or detergent. They show no absorption in the visible region of the spectrum; they absorb highly, however, in the near ultraviolet. This absorbed energy is emitted as light of longer wavelengths; treated fabrics reveal this emission as visible blue fluorescence—a color capable of masking the normal yellowish cast of most cotton or woolen cloth. Further, fabrics treated with such fluorescent agents have an increased surface reflectance and are more brilliant than untreated fabric. In this respect, Antara Brighteners differ sharply in action from old-style bluing which, although masking yellow coloration, decreases the over-all reflectance of the treated cloth.

The brightener may be added to the final detergent product and thoroughly mixed by milling or tumbling, or may be added in the final stages of processing such as in milling, crutching, or at a fluid stage prior to spray or drum drying.

These brighteners are stable to the common soap and detergent builders such as alkalis, starch and carboxyl methyl cellulose. Their stability to hypochlorite bleaching is a factor of importance to the commercial laundry trade.

Wax Ester

For use in lubricants, greases, plasticizers. (206B)

The Petrolite Corp. has announced the development of Wax Ester No. 60. Now available for shipment, it is a synthetic wax ester petroleum derivative.

It has possible uses in the manufacture of lubricants and greases, plasticizers, tin dipping formulations, wire drawing lubricants, thread sealing compounds, soaps and wetting agents, synthetic resin modifiers. —*End*

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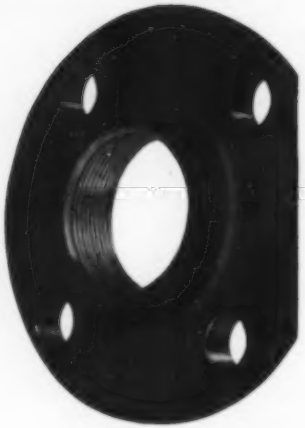

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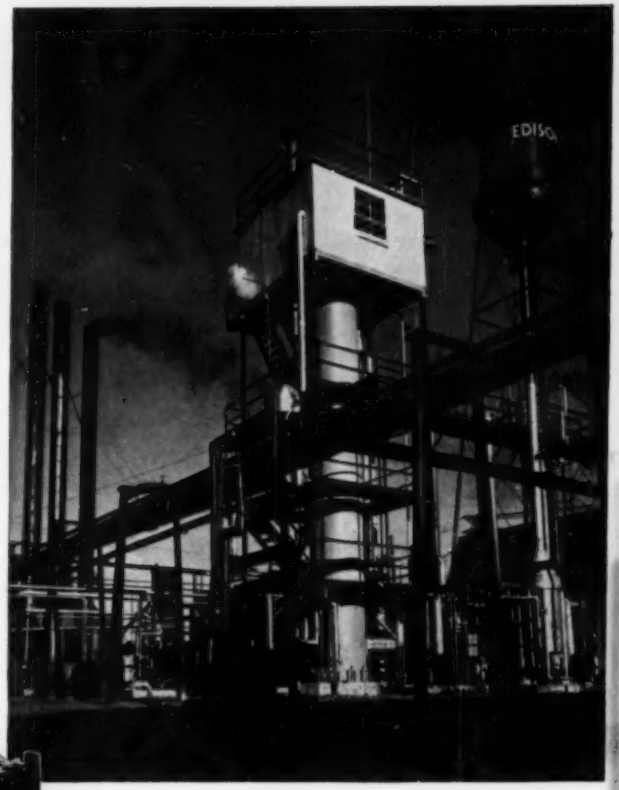

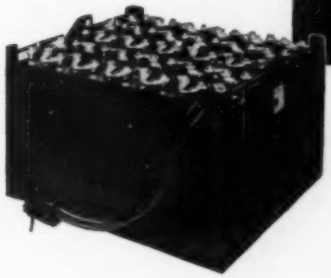

One active material in EDISON batteries is finely divided iron, so pure it is also used for pharmaceuticals and food enrichment. It is made by reducing ferric oxide with hydrogen.

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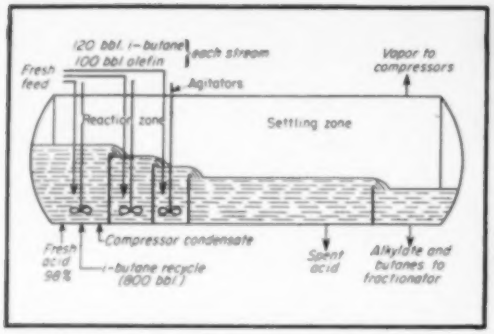
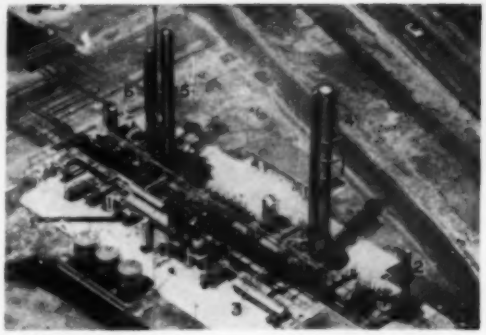
Gas Processes Division





HEART of the process is the reactor, with high isobutane-olefin ratio, cascading flow, agitators, and auto-refrigeration. Alkylation plant shown here was designed by M. W. Kellogg, and is located at the Perth Amboy, N. J. refinery of the California Refining Co.

H_2SO_4 Alkylation

A CHEMICAL ENGINEERING PICTURED FLOWSHEET

Today the quality requirements of military aviation gasoline have been stepped up to 115/145 octane rating. During the last war, when 100/130 was the standard, alkylate comprised about 35 percent of each barrel of aviation gasoline. In a good many cases, the higher standard may now more than double the amount of alkylate required for blending with refinery gasoline. This means new and improved facilities for alkylation.

WHAT'S NEW

In essence, alkylation is a method of combining isobutane with olefinic light hydrocarbons with the aid of a catalyst. The purpose is to produce a product having the high-octane virtues of the light refinery gases, but without their prohibitively high volatility.

Improvements in the design of alkylation plants are upping the quality—and quantity—of alkylate. For example, the latest M. W. Kellogg design for an H_2SO_4 alkylation plant provides for a nine-to-one ratio of isobutane to olefin in the reaction zone. This is true despite the fact that the ratio of isobutane to olefin as fed to the reactor as a whole is less than four-to-one. Thus high concentrations of isobutane are maintained in the reaction zones, while the circulation load is relatively low. High quality alkylate is produced without adding to pumping and vessel costs.

Cascading flow of acid and feed from the first section of the reactor onward allows the reaction to take place while the acid is still relatively high in concentration. For example, if it is planned to feed 98 percent acid and withdraw 88, the average acid concentration in the three sections will be 91.5. The result is better quality alkylate.

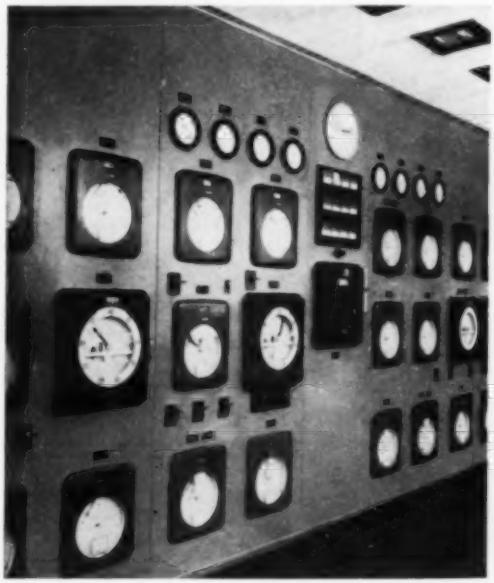
A third improvement in design is the use of agitators for efficient mixing. High-quality alkylates have been produced with a power requirement of 0.028 kwh. per gal. of alkylate as compared with 0.12 kwh. in reactors without agitators.

Final important design advantage is the use of auto-refrigeration. Heat of reaction is removed by continuous vaporization. Vapors withdrawn from the top of the reactor are compressed, condensed, and returned. Investment cost is much lower than for outside refrigeration-emulsion cooling systems.

THE PROCESS

Liquefied gases are introduced into a reaction chamber in the presence of concentrated sulphuric acid, which acts as a catalyst. During the reaction, which generally proceeds at a temperature between 38 and 40 deg. F., the sulphuric acid drops in concentration due to dilution by moisture in the liquefied gas stream and side reactions with impurities in the feed. The acid is continuously withdrawn as it is spent. Fresh acid is regularly introduced to keep the quantity and concentration of acid in the reactor constant. The product of the reaction is passed through a caustic wash and then fractionated at higher temperatures.

During the war, this process was primarily used to produce aviation alkylate from butylene and isobutane.



Panel gives an idea of the amount of automatic control associated with the operation of this modern plant. →

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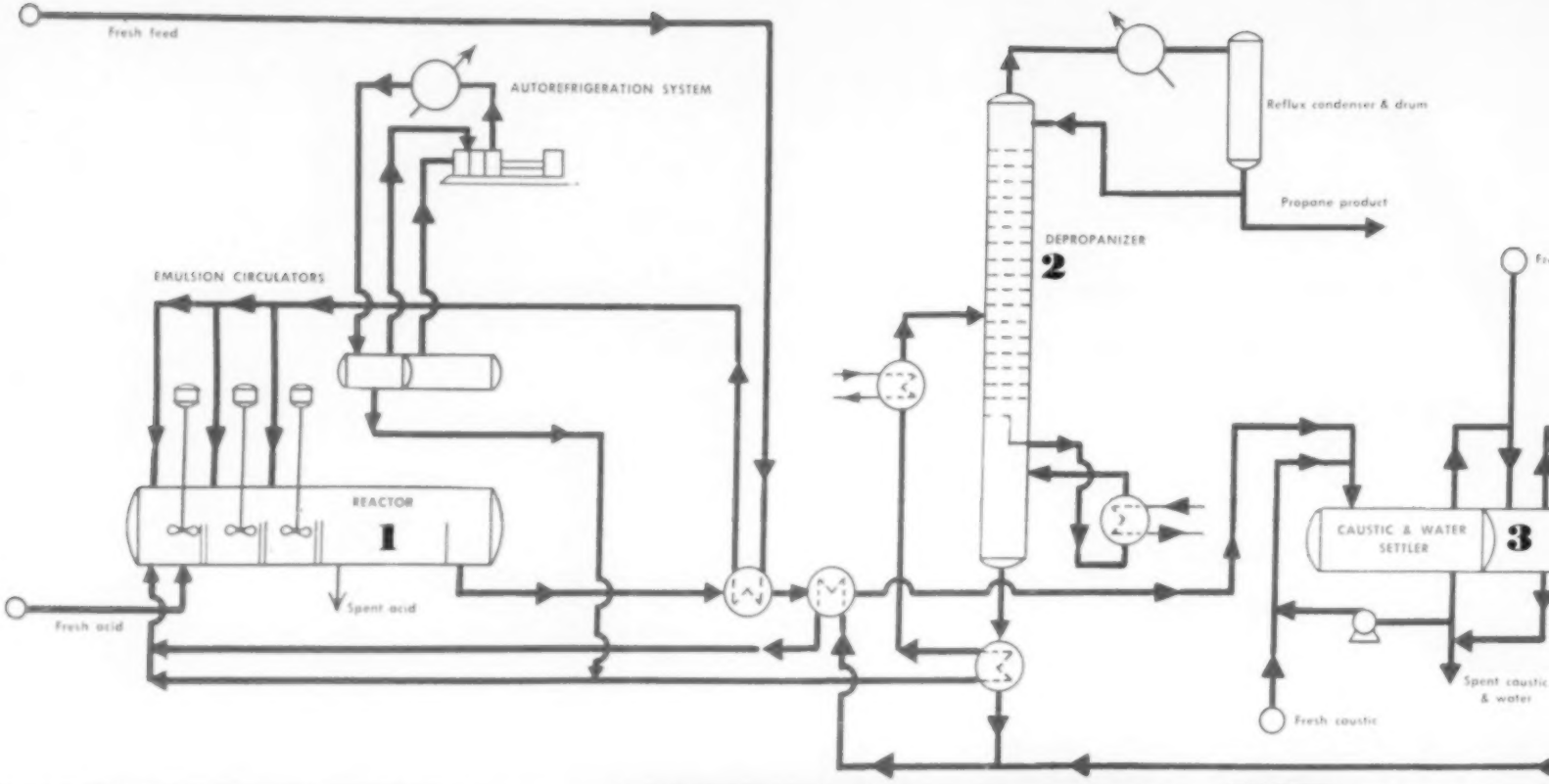
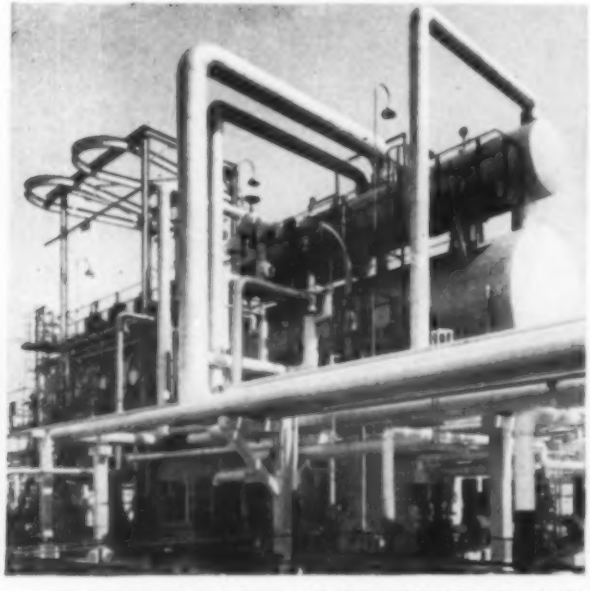
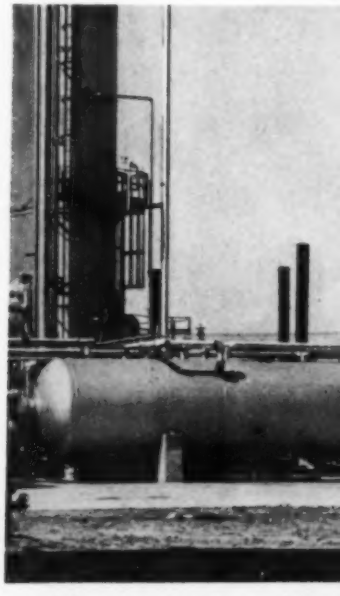


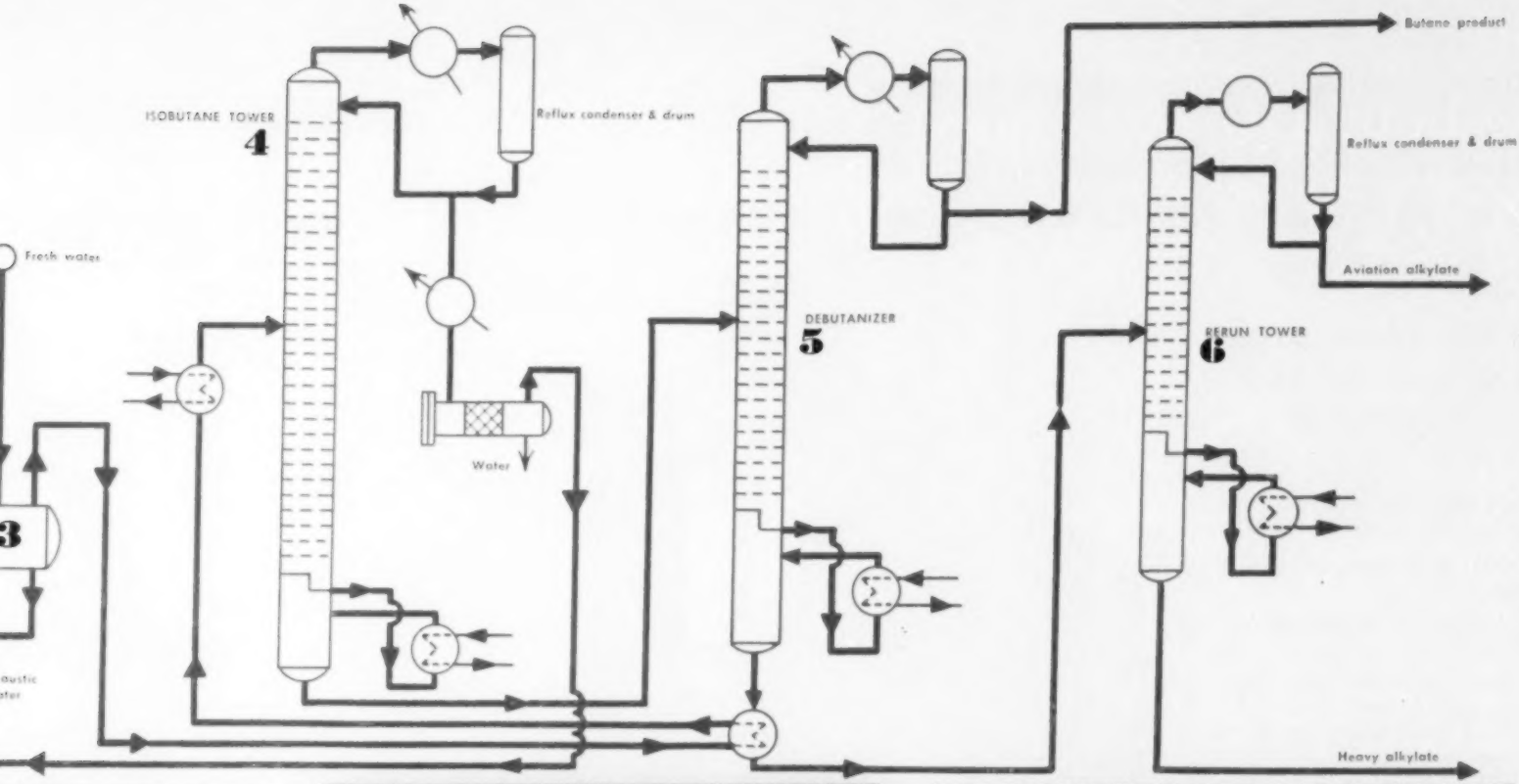


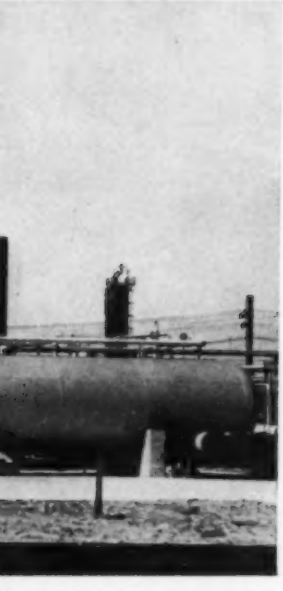
1 The reactor combines isobutane with olefinic light hydrocarbons in the presence of sulphuric acid catalyst to form the alkylate.

2 Propane is fractionated from the liquefied vapors which are withdrawn continuously from the reactor to the auto-refrigeration system.

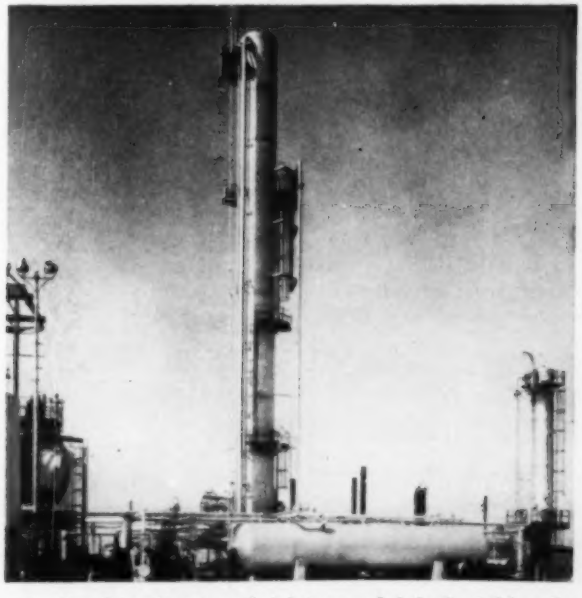


3 Effluent from the reactor, consisting o is caustic and water-washed to neutra

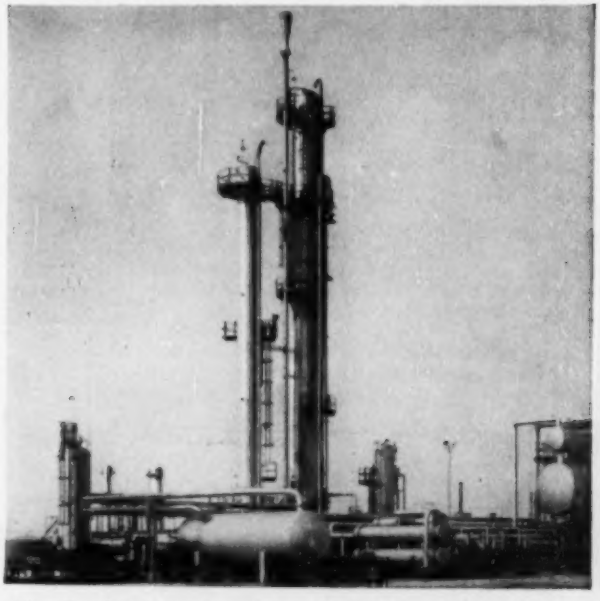




ing of alkylate and isobutane recycle, eutralize residual acidity.



4 After the caustic-water wash, isobutane recycle is fractionated from the alkylate and normal butane in the largest tower of the group.



5, 6 Larger tower separates normal butane from alkylate, which is rerun in smaller tower to meet end point specifications.

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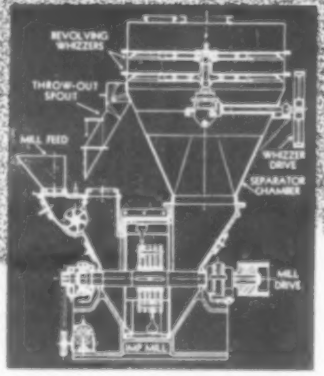
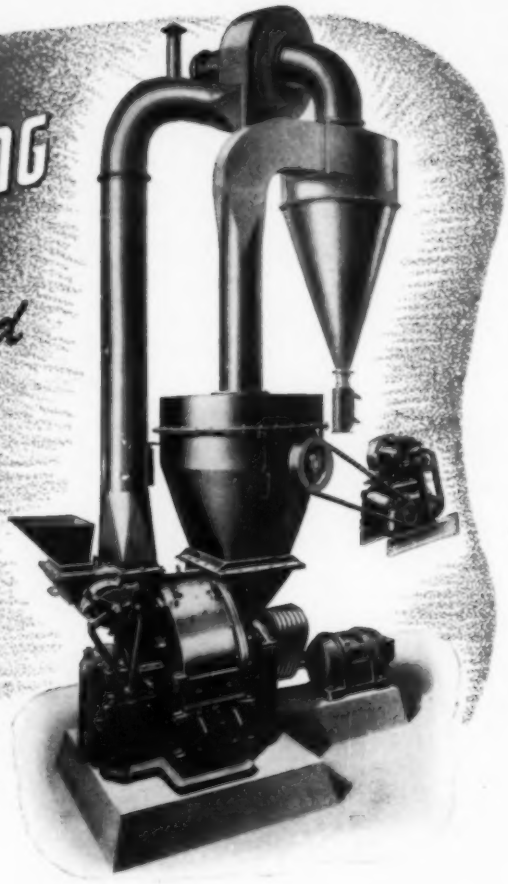
WHIZZER EQUIPPED IMP MILL



Cross-section showing location of revolving whizzers and drive.



The whizzer-equipped Imp Mill combines pulverizing, classifying and conveying of materials in a continuous, automatic process which saves re-handling. In a great number of cases, Flash Drying accessories may be added to the equipment for simultaneously removing moisture while pulverizing.

One simple adjustment of the whizzer provides a wide range of fineness control to 99.9% or better passing 325 mesh. Requiring a minimum of supervision, this unit will, with a given setting, deliver a consistently uniform fineness product. Where these mills are used for moisture removal, they have the ability to hold final moisture content within narrow limits.

The Raymond *whizzer* Imp Mill is a proven low-cost producer of pigments, special clays and fillers, phosphate materials and a great variety of other chemicals. In many instances, it will show important savings in the production of these and similar materials.

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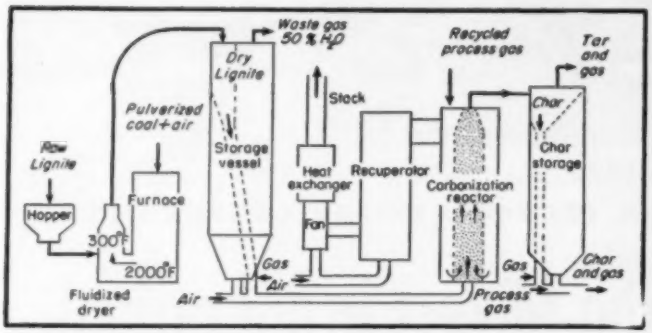
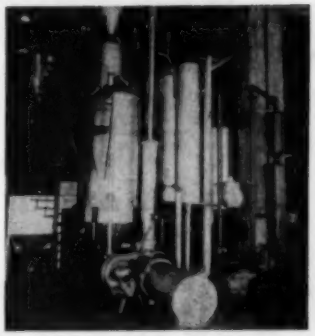


COMMERCIAL PROCESS: 7,000 tons daily at Alcoa's new lignite plant in Texas.



PILOT PLANT: 25 tons daily at Denver.

Lignite Process Hits the Mark

Novel carbonization process turns out crude tars and a char competitive with natural gas as a cheap fuel, opens up vast reserves of low-rank coals. Texas gets first plant.

This latest technique in the low-temperature carbonization of coal—now to be commercialized after two years of research work—already has the earmarks of a development that may very well affect the future economy of many industries and of wide areas.

That seems to be the general—but not unanimous—opinion of chemical engineers, power men, coal processors and light-metals authorities throughout the country.

The new process, developed by the Bureau of Mines at its Denver laboratories, uses lignite and other low-rank non-coking coals to turn out crude coal tar and a high-heating char ideal for power plant use. It hinges on the principles of fluidized drying and low-temperature carbonization.

First commercial plant to use the process will be at Aluminum Co. of America's reduction works to go up in Milam County, Texas, near Waco. There a battery of lignite processing units will provide solid fuel for the steam-driven power generating facilities that Texas Light & Power Co. will build and operate for Alcoa. TL&P cooperated with the Bureau of Mines in developing the process.

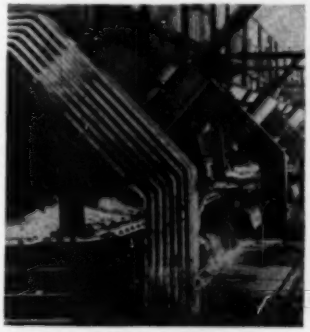
In the new Texas plant, slated to go on stream in the fall of 1952, close to 7,000 tons of lignite will be processed daily into some 3,200 tons of char and 2,300 bbl. of tar. Cost of the twelve 575-ton-a-day units will be close to $9 million (for more details on the Alcoa lignite set-up, see *Chementator*, p. 107, this issue).

Its Impact: Economic impact of BM's new development—generally known as the Parry process—may eventually spread out into many fields and geographic areas:

▶ Most significant, by far, are its long-range possibilities in opening up the nation's vast and largely unexploited reserves of lignite and other low-rank non-coking coals. These deposits are scattered throughout the West and Southwest. Reserves of lignite in Texas' Milam County alone easily top 100 million tons. There's even more in such states as Montana and North Dakota.

". . . applicable to any coal of lesser rank than high volatile bituminous B—and that means 90 percent of all western coals . . ." says V. F. Parry, chief of BM's Denver coal branch laboratories and the man who supervised the development of the process.

▶ Most immediate impact will probably be in the power generating field. Here it is significant to remember this: Alcoa and Texas Power & Light, both veterans in figuring out the fine points of energy economics, are willing to jump in on a large scale early in the game. And in Texas, too, deep in the heart of natural gas' undisputed bailiwick.



FIRST USE: energy for aluminum cells.

". . . this process offers a great opportunity to thermal power plant operators throughout the West," Parry adds, ". . . and (its char) can compete with natural gas as a fuel." He estimates that byproduct tar recovery would put Milam County lignite char on a par with natural gas selling at 5-8 c. per 1,000 cu. ft. Cost of mining the lignite is said to be only $1.00-1.50 per ton.

By using lignite char to fuel its power generating plant, Alcoa may be able to get its energy for aluminum reduction at about 3.5 mills per kwh. Credit from tar and oil byproducts might shave this to 2.5 mills.

Raw lignite—with some 35 percent moisture—has a heating value of 7,000 Btu. per lb. The bone-dry processed char has a value of 10,600 Btu. per lb. Thus the char has only 45 percent of the raw lignite weight but retains 75 percent of the heating value—an obvious shipping advantage.

(Continued on page 222)

Turbo-Topics

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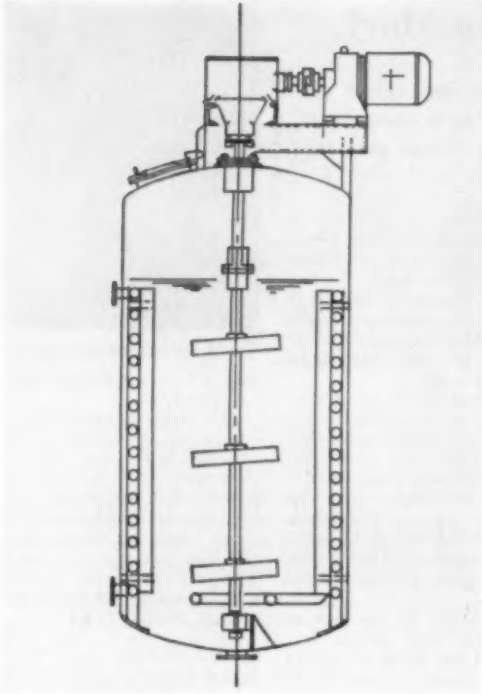

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The entire 300 h.p. mixer was designed and supplied by Turbo-Mixer.

The success of these units—and the 200 h. p. Turbo-Mixers before them—rests upon custom design. Turbo-Mixers are always built for the specific job to be done. They work day-in and day-out with peak results.

Evidence of this efficiency and dependability can be found in the fact . . . that Turbo-Mixer has produced over 80% of the fermenters in the anti-biotic field throughout the world!

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NEWS, cont. . . .

▶ Lignite's place in our coal-tar chemical economy is not yet so clear-cut. Some non-coking coals that can be processed by the Parry method will yield up to 45-55 gal. of tar oil per ton. Big question seems to be: what's the tar and oil worth on today's market, what will tomorrow's markets be?

". . . tar recovered from an average western coal will have a value of at least 8-10 c. per gal.—equal to the value of the raw coal," Parry says, ". . . indicating processing costs of the tar oil are relatively nominal." Milam County lignite is expected to yield 14 gal. of tar per ton.

Alcoa evidently plans to use its 2,300 bbl. daily of crude tar as a fuel or to sell (or refine) it, depending on economic and market factors. The tar has a fuel value of some 4-5 c. per gal.

Later, of course, lignite tars may find their market niche as feed stocks for conversion into aromatics such as benzene, toluene and xylenes. Light naphthas can be distilled off for use as a gasoline blending agent. Tar acids can be extracted by standard coal-tar processes.

The process, Parry says, can be used to produce liquid fuels in two ways: (1) by hydrogenating its tar oils, using relatively little hydrogen, to turn out quality synthetic liquid fuels ranging from heavy industrial fuel oil to aviation gasoline; (2) by using its carbonizing equipment to extract oil from oil shale fines that now have to be discarded (for latest shale oil development, see *Chem. Eng.*, p. 202, Aug. 1951).

He is convinced the West can get its lowest-cost power by processing non-coking coals and by integrating this power production with the manufacture of synthetic liquid fuels ". . . because of the advantages in extracting the tar before burning the charred residues for power."

How Process Works: Heart of the Parry process lies in two unit operations: (1) fluidized drying of the crushed raw lignite; (2) low-temperature carbonization of the dried lignite to produce tar and char.

The process is not designed to handle coking coals; fuels with weak coking properties have been carbonized successfully in the Bureau's 5- and 25-ton-a-day pilot plants (see cut) at Denver. The method has been under development for close to two years. It was worked out as a cooperative project between the Bureau of Mines and Texas Power & Light Co.

BM has designed for Texas Power & Light a 575-ton lignite processing unit patterned after its own pilot plants. Here are the major operating features (see cut) of a commercial plant (excluding tar- and gas-scrubbing units) as Parry described it to *Chemical Engineering*:

Lignite crushed to pass 0.25 in. is fed into a stream of combustion products that are generated by burning pulverized lignite under pressure. The sensible heat in the combustion gases at 2,000 deg. F. is transferred to the raw lignite to evaporate its moisture and to raise the temperature of the mixture to about 300 deg. F. This is done in a fluidized or entrained bed just above the screw feed.

The mixture moves upward to dust separators in the upper part of the storage vessel. Moisture and waste products leave through the stack. The hot, dried lignite moves down the conduit to feeders that regulate the flow to the carbonizer. Treatment time in the fluid bed is about 30 sec.

Hot, dried dust from the dryer is conveyed pneumatically to the base of the carbonizing reactor—a heat-resisting alloy cylinder mounted in a furnace setting that burns process gas around the cylinder. Hot gases from the combustion zone pass through recuperators and heat exchangers to preheat the ingoing air and gases.

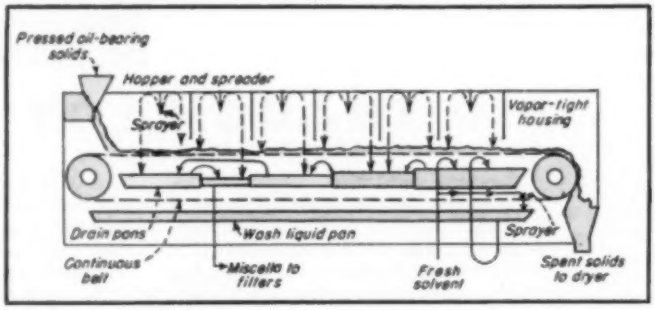
Clean process gas, generated during the carbonization, is recirculated to the base of the reactor by passing downward through an annular space next to the heated walls. This hot gas enters the center of the chamber and carries the fine coal upward in a fluidized state.

Air entering with the preheated coal combines with the gas and char to liberate heat at the desired temperature. The temperature of the fluidized mass inside the reactor is maintained by passing heat through the walls of the retort and by combustion of the air and char. The temperature is regulated by adjusting the rate of coal and air fed to the bottom of the reactor.

Carbonization can be carried out at any temperature. Optimum is close to 900 deg. F. for producing maximum tar and enough gas to supply heat for carbonization with enough excess to transport the char to the power plant burners. There it is burned in the usual manner in the combustion chamber of the boilers.

Lignite char has a volatile content of about 25 percent and a heating value of 10,600 Btu. per lb. The process gas has a heating value of 150 Btu. per cu. ft.

A lignite processing unit of this type is designed for a capacity of 25 tons per hour. Large plants would have one battery or more of such units. Over-all thermal efficiency of the operation is about 91 percent.



New Continuous Extractor

Solvent percolates through self-filtering bed of oil-bearing solids, minimizing fines problem. Stagewise operation makes circulation and feed rates independent.

Maximum oil recovery for a range of several vegetable oil-bearing substances is the feature of a new design using percolation and stagewise operation.

Recent advances in material preparation have led to the development of a new continuous percolation extractor for oleaginous substances by Wurster & Sanger, Inc., of Chicago. Percolation of solvent through a self-filtering bed of solids practically

eliminates the "fines" problem—always a processing headache (especially in the extractor) with high oil seeds, which are the bulk of world oil seed production.

The extractor is a vapor-tight housing inclosing a continuous, horizontal, porous belt. A variable speed drive at the discharge end keeps the belt taut under load and conveys solids through the extractor at an average speed of 6 in. per min. Vertical partitions divide the space above the belt into a series of chambers in which solids are alternately sprayed with solutions of decreasing concentration and then allowed to drain. Following a final spraying with fresh solvent, they are drained and discharged.

Strong miscella is withdrawn from the second stage rather than the first stage in order to obtain a clear product. Fines are high when solids are first introduced and the switch from countercurrent to concurrent operation in the first two stages takes advantage of the filtering action of the solids bed.

Entering the extractor through a spreader-feeder, fresh solids are sprayed to insure complete wetting before striking the belt. In the spray chambers nozzled manifolds direct the solution upward against a distributor to break force and give even distribution. Percolation rate of the solvent at the flooding condition is several times the feed rate of fresh solvent to the extractor, which makes stagewise operation necessary.

Operating under these conditions also increases contact time between solution and solids, resulting in a more efficient extraction. Drainage chambers allow 2-min. free drainage periods between 8-min. sprayings. A final drainage of 16 min. reduces retained solvent to a practical minimum—for example, 0.550 lb./lb. inert solids for 0.009 in. soybean flakes. Further recovery is not feasible because the extractor would become excessively long. Spent solids discharged to the dryers retain 0.3-1.0 percent oil.

The solution that has percolated through the solids drains into pans located between the belt halves and is fed into the preceding stage by overflow. Pans are arranged so fines that carry through with the percolating solution are withdrawn by the pump and sprayed on the solids to be filtered out. Solution concentration increases gradually with countercurrent flow from the last stage to stage 3.

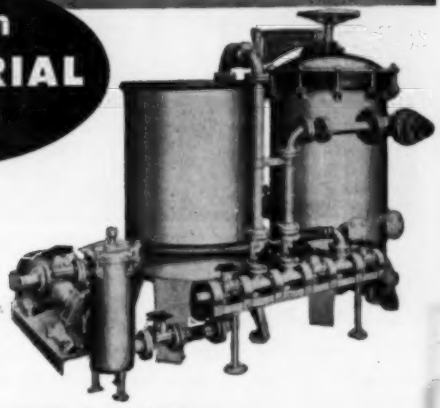
Solids that cling to the lower half of the belt rather than discharging are washed off with fresh solvent into a drip pan. They are returned to the system by pumping into the solution pan of the final stage.

(Continued)

Solution Clarification?

Any Solution—Any Quantity

use an INDUSTRIAL Filter



100 to 15,000 gallons per hour. Portable and stationary models. Standard or special filtration systems engineered to meet unusual requirements.

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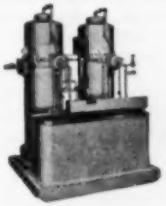
INDUSTRIAL Water Demineralizers



A Two-Bed INDUSTRIAL Water Demineraliser. Standard two-and four-bed units available with capacities of 200 to 1000 gph. Special units of any capacity engineered to requirements.

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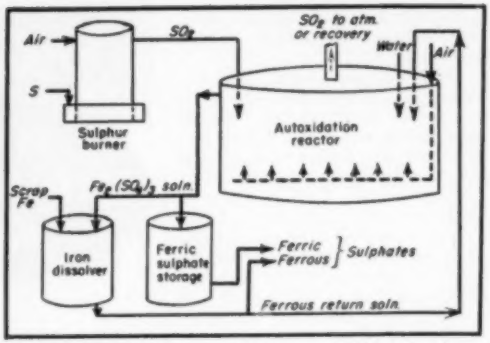
WOOD is the chief material of construction at this Phoenix unit.



HEART of autoxidation process is the reactor vessel shown above.

Autoxidation Pans Out

For 50 years engineers have tried to convert low-strength SO_2 into sulphates or acid by catalytic air oxidation in solution. Here is the first commercial process.

Improved autoxidation processes are now being developed by Infilo, Inc., Tucson, Ariz. They produce dilute sulphuric acid or iron sulphates from low-strength SO_2 by catalytic air oxidation in water solution.

Infilco's proccesses are based on the decade of autoxidation work done by Harmon E. Keyes, consulting chemical and metallurgical engineer. Keyes recently joined Infilco's staff in Tucson.

In the basic autoxidation reaction sulphur dioxide is brought into contact with air in a water solution containing a small amount of iron or manganese as catalyst. It produces iron sulphates or dilute sulphuric acid.

The improved Keyes-Infilco process has several significant features:

- It can use SO_2 of almost any strength, pressure or purity—such as hot and dirty stack gases from smelters, roasting plants or oil refineries.
- It can use scrap iron of almost any form or grade. The ferric sulphate unit at Phoenix, for example, now uses worthless tin cans, shredded and cleaned, from municipal garbage.
- It requires only the simplest materials of construction—largely wooden tanks and lead pipes. The equipment is simple, the capital investment low.
- It operates continuously and needs little operating labor—one man per shift can produce 5 tons or more of ferric sulphate daily.
- It can produce, in the same plant, either ferric sulphate for coagulation, ferrous sulphate or low-strength sulphuric acid that can be concentrated to commercial strength.
- It is economical to operate. Cost of making coagulation-grade ferric sulphate at the Phoenix unit, for instance, is estimated at 50 percent or less of the present purchase price.
- It produces a ferric sulphate coagulant of any desired acidity for optimum coagulation. This is done by simply regulating the autoxidation reaction.

Infilco's program is a completely integrated plan. It includes methods and equipment engineered for specific installations to make acid or other sulphate chemicals from various sources of SO_2 gas and to concentrate dilute acid to commercial strength.

The Phoenix autoxidation unit produces ferric and ferrous sulphate for the city's water and sewage treatment systems. It is supervised by Dario Travaini, superintendent of the Phoenix systems.

Sulphur dioxide is generated continuously in a specially designed pressure burner that uses crude lump sulphur. The SO_2, at 2-3 psi., and air are introduced simultaneously but separately into wooden tanks containing a solution of ferrous sulphate (see cuts). The cells are connected in series with respect to the solution flow.

A ferric sulphate solution with up to 7 percent Fe is made. Free acidity is controlled to any desired pH. Oxidation of the iron in solution is 95 percent. The operation is continuous.

Cleaned and shredded tin cans from the municipal garbage are used after a burning and screening operation. This iron is used to reduce part of the ferric solution back to the acid-free ferrous state; this solution is recycled to the autoxidation reactors for formation of more ferric salt.

Air to the sulphur burner and reactor cells is supplied by a positive pressure blower at 3-7 psi. Loss of SO_2 through the reactor vents has been practically eliminated.

At present, capacity of the Phoenix plant is about 5 tons of ferric sulphate per 24 hr.

One of the units at Phoenix was used recently to demonstrate the ability of the autoxidation process to make low-cost sulphuric acid. When acid is made, iron is kept at a minimum strength of about 0.5 percent. The dilute acid can be used for leaching or other purposes or it can be concentrated by gas or steam heat.

Ozone Kills Phenols in Waste

New data now show that ozone is one of the most effective agents for oxidizing phenols in industrial wastes. And it turns out to be far cheaper than everyone thought.

These findings, recently reported for the first time, come as a surprise to most people. Ozone had always been looked upon as entirely too expensive for this use; it had evidently never been tried out on a large scale with phenol-containing coke plant wastes.

Nub of the secret, it's now known,

(Continued)

Sarco Temperature Regulator, type 24-30, pilot-operated, single seated for positive shut-off on dead end service.
Sarco Temperature Regulator, Type KR-14-AWF with three-way diversion valve for modulation.

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Each heating coil is equipped with a SARCO self-operated regulator with liquid-filled, extra sensitive thermostat, to provide modulated control.

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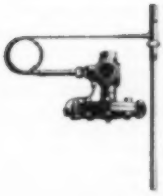
RESULT: Safe, extremely sensitive control of room temperature at a fraction of the usual cost.



Sarco Temperature Regulator, type 24-30 pilot-operated, single seated for positive shut-off on dead end service.

Catalog 601 contains full information on simple temperature controls for many other applications. Write for your free copy today.

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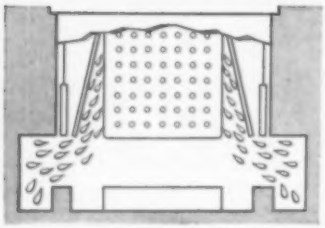
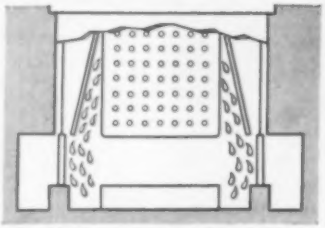
LOOK!

2 successive liquids separated without mixing



CURB OPEN to permit first liquid to be separated and evacuated from machine.



CURB SHUT, second liquid is separated and removed through lower outlet without mixing with first liquid.

Industry benefits from broad use of centrifuging . . .

thanks to new AT&M developments. The centrifugal above — a profitable investment wherever two or more liquids are separated in a cycle — is but one of many outstanding AT&M centrifugals that save time, space, costs.

As the drawings above show, this curb is designed to remove two *successive* liquids without mixing. With the curb open, the first liquid is separated and evacuated through the curb outlet. The curb is then closed and the second liquid is separated and removed through a different outlet.

You, too, can benefit with AT&M equipment. Does away, in many instances, with settling tanks, filter presses, squeeze rolls, vacuum presses. Used in processes involving chemical preparations — explosives — nitrating — acid wringing — ammonium sulphate — food products — soap — drugs, medicines, cosmetics — oils and greases — paints, varnishes — ceramics, brick, clay — fertilizers — nitrates — sludges — textiles — carbonizing (textiles) — plastic bases.

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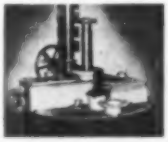
P.S. PROVE TO YOURSELF how centrifuging can benefit you. Send us a sample of your material for centrifuging to your specifications or rent an AT&M laboratory centrifugal for your own tests at a nominal fee.



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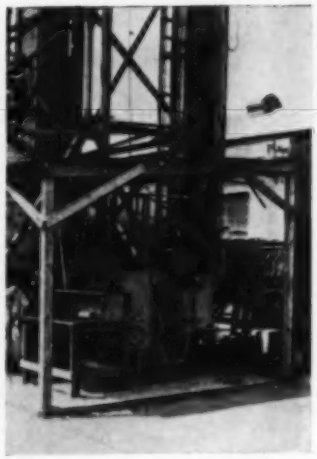


PILOT PLANT at Armco Steel Corp. gives new data on oxidizing wastes.

is that the reactions of ozone on coke plant phenolic wastes aren't comparable to those of chlorine. This scraps a lot of cost calculations and puts the spotlight on ozone as an effective and economical oxidant for phenol wastes.

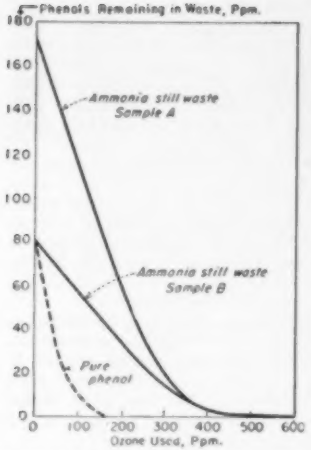
As a result, several steel plants in the Ohio River Valley are already considering putting in ozone systems to treat the phenolic wastes from their coke plants. Their decisions, expected within a few months, will hinge on the Steel Action Committee's definition of how much residual phenol is permissible after stream dilution.

In addition, the petroleum industry is now showing keen interest in ozone as a possible solution to its own problems with phenol-containing refinery wastes.

The new data on chemical oxidation of phenol wastes came from a cooperative study under the direction of the Ohio River Valley Water Sanitation Commission, with Sanitary Engineer John E. Kinney as project coordinator. The pilot plant was built by Armco Steel Corp. at its byproduct coke plant in Hamilton, Ohio. Work on ozone was done by the Ozone Processes Division of the Welsbach Corp., Philadelphia.*

The Set-Up: Work at the Armco pilot plant was on a dephenolized ammonia-still effluent from Armco's byproduct coke plant. Phenol concentration (as monohydroxy derivatives of the benzene ring) ranged from 28-332 ppm. Chlorides were 7,000-9,700

* Also participating in the broad cooperative project: Wallace & Tiernan Co., Inc. (chlorine), Mathieson Chemical Corp. (chlorine dioxide), Ohio State Dept. of Health, U. S. Public Health Service. Results are given in a report issued June 15, 1951 by the Ohio River Valley Water Sanitation Commission.



OZONE dosages for typical effluents from a dephenolized ammonia still.

ppm. ammonia up to 2,390 ppm., BOD 300-400 ppm. Temperature from the still was 212 deg. F. and pH of the waste was usually above 11.

The pilot plant (see cut) was designed to handle a continuous flow of 2 gpm. or a batch up to 350 gal. Its holding tank had a capacity of 1,000 gal.

The reactor—heart of the set-up—was a tower 18 ft. high and 2 ft. in diameter. It was constructed so that the liquid depth could be varied at 2-ft. intervals.

Ammonia still waste was pumped from the steam-heated holding tank through a rotameter into the top of the reaction tower. Ozonized air from the ozonator was fed into the bottom of the tower through a stainless-steel diffuser tube. The treated effluent was drawn off just below this tube.

Ozone was generated by a Welsbach Type C ozonator at the rate of 0.5 lb. per hour. Both batch and continuous runs were made. Continuous runs were at flow rates of 0.5-3.0 gpm.

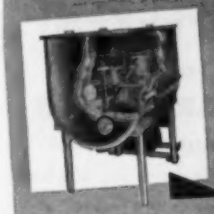
The Findings: Here are the significant results that came out of Welsbach's work with ozone:

▶ Batch treatment is more efficient (and probably cheaper in the long run) than continuous operations. There is no violent mixing of the effluent that dilutes the incoming waste with partly oxidized waste.

▶ Only 600 ppm. of ozone reduces the phenols to less than 1 ppm. But it takes 1,000 ppm. or more to reduce them to 5 ppb.—considered by Public Health to be the taste-producing limit.

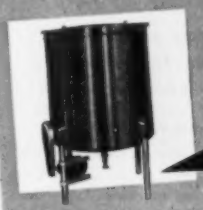
(Continued)

SAN-I-TANKS give you capacities beyond gallons



In Chemical Processing a stainless steel tank should have capacities beside those measured in gallons. Every standard SAN-I-TANK, through Metal Glass "custom design" engineering can be made to do one special job or adapted to combine several operations for greater JOB CAPACITY that cut costs and speed production. Here are two of the many adaptable SAN-I-TANKS.

Type "CHR": Jacketed, insulated, stainless steel. Suited to all types of hot or cold, light or heavy processing. Wiping action of agitator arms prevents materials from lumping or adhering to tank sides. Standard capacities: 150, 300, 500, 1000 gallons. Write for Bulletin CHR-50.



Type "CJ": An open top, jacketed, stainless steel tank for every kind of hot and cold processing. Jackets for working pressure up to 150 p.s.i. Can be equipped with side, bottom or top-entering agitators and all types of [illegible] and connections. Capacities: 60 to 1000 gallons. Write for Bulletin JS-50.

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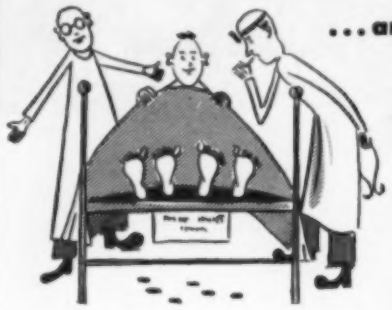

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NEWS, cont. . .

- ▶ Pure phenol requires less ozone for complete oxidation. Ammonia-still waste has other oxidizable materials.
- ▶ Best results were obtained when the pH of the waste was above 11.5 but below 12.8.
- ▶ Average reduction in the chemical-oxidation demand (COD) of waste was 0.7 parts for each part of ozone. BOD was reduced about 60 percent.
- ▶ No serious foaming developed at temperatures as low as 43 deg. C. Foaming occurs if the waste cools to ambient temperature.
- ▶ Ammonia content of the waste has little or no effect on ozone treatment.
- ▶ Although the reaction appears to be instantaneous, contact time must be considered in the plant design since the ozone is added as a 1-2 percent gaseous solution.
- ▶ Partial treatment does not produce chlorophenols; ozone-phenol reaction products are less objectionable than phenol itself. Residual ozone can be controlled to less than 1 ppm. and requires no after-treatment.
- ▶ Laboratory studies show that other types of phenol wastes—those from synthetic phenol manufacture, phenolic resins plants and petroleum refining operations—would respond to the same treatment.

The Costs: Actual costs of an ozone-treating system for coke oven waste will vary with the capacity, phenol content and other factors influencing the plant design. However, Victor Hann, director of Welsbach's Ozone Processes Division, has come forth with the basic cost factors.

Installation costs of treating systems using chlorine or chlorine dioxide would be quite a bit less than that of an ozone set-up, Hann says. But, he adds, the treatment costs for chlorine would be 2-3 times as high as for ozone, for chlorine dioxide 6-8 times higher. Both require higher dosages of oxidizing agent. Hann concludes that the low operating cost of the ozone process will offset the first cost differential within 2-5 years.

Of the initial investment, the ozone-producing equipment would account for about 95 percent of the total cost.

Total electric energy for ozone generation (including drying the air and dryer reactivation) is 10-12 kwh. per lb. of O_3 when air is used. This drops to 6 kwh. when oxygen is used.

All in all, Hann estimates that coke plant phenolic wastes can be treated with ozone for a total cost of about $1.00 per 1,000 gal. of waste.

With a larger treating plant and using low-cost oxygen, Hann estimates that costs can be cut to 35c. per 1,000 gal. of waste. *(Continued)*

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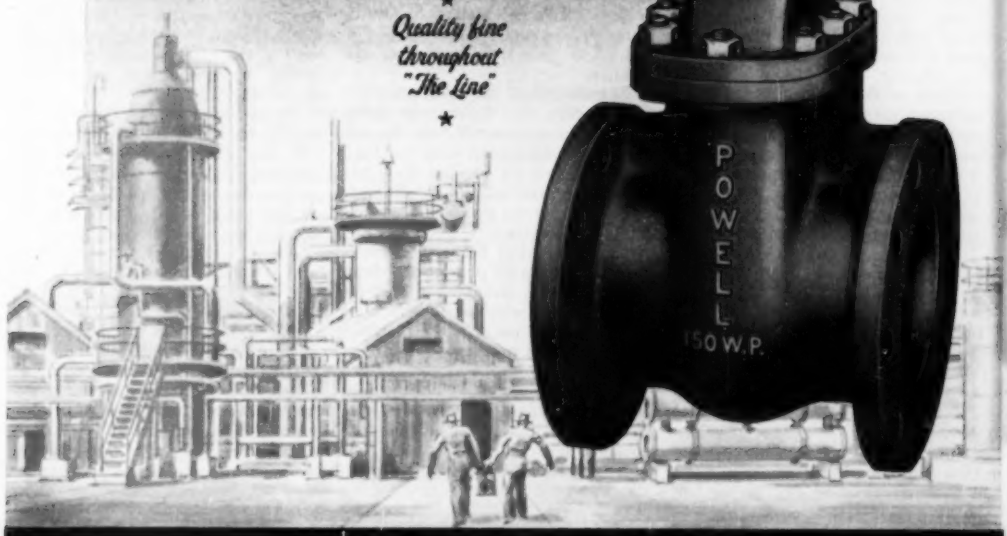
Fig. 2453-G. Large 150-pound O. S. & Y. Gate Valve. All the dimensions conform to the latest standards. Can be furnished in: Stainless Steels, Hastelloy Alloys, Monel Metal, Herculoy, Everdur, Inconel, Nickel, and other metals and alloys.



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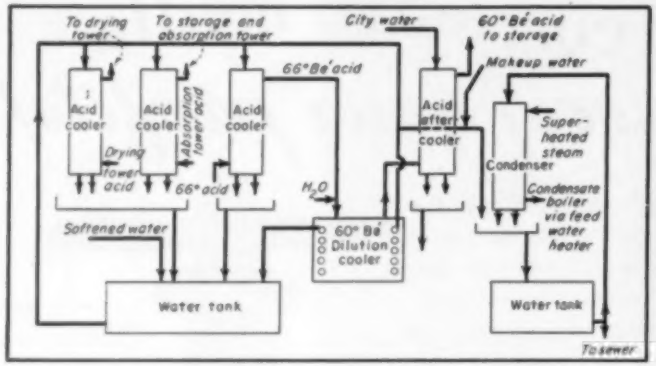
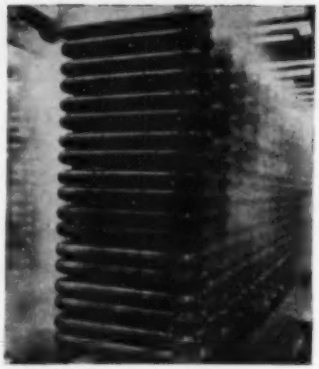


TIE-IN of acid coolers and steam condensers solves problems at sulphuric plant.



COOLING section for 98 percent acid.

Smart Kinks in Acid Cooling

Here's a novel way to cool sulphuric acid by a combination cooler and cooling tower. It cuts operating costs, saves water and solves the problem of water that's too hard.

Engineers at the Indianapolis sulphuric acid plant of Marion Manufacturing Corp. recently found themselves with a problem on their hands: their acid cooling system was getting less efficient. The cause: increasing hardness of the well water that built up scale on the cooling sections at a faster clip.

"We had to do something and do it fast," explains Plant Superintendent J. T. Roebuck, "for the $CaCO_3$ hardness of our water jumped from 325 ppm. to 650 ppm. in 18 months."

Hard scale 3-4 in. thick had to be removed periodically from the coils by Dowell cleaning. But this jacked up cooling water costs (including cleaning, maintenance, chemicals and wear on pumping equipment from high acid temperature) to about $40 a day—too much for a plant making 230 tons of 60-deg. Be. contact acid daily.

"Besides," Roebuck adds, "downtime limitations kept us from doing a thorough cleaning job. So we had to have spare sets of cooling sections for replacements while we sand-blasted the fouled sections."

An ingenious—and economical—solution was then worked out by Marion's engineers in cooperation with those of the heat transfer division of National Radiator Co., Johnstown, Pa.

NEW COOLING SYSTEM

Crux of Marion's new system is to cool by evaporation rather than by circulating water. Proper design accounts for its success. Large cooling surfaces guarantee a high cooling water temperature. And proper spacing of the stacks gives a maximum air circulation.

Evaporative cooling takes place (1) in the spray from the nozzles above the cooling sections, (2) from the surfaces of the cooling sections that have been arranged for free air flow, (3) from the heated water as it falls from the bottom of the stacks to the catch basin 13 ft. below.

Principal part of the new system is used for cooling 98 percent acid from the drying and absorbing towers. It consists of two sets of cooling sections (each with 15 stacks of 18 National Radiator cast iron cooling sections) set up for parallel flow of absorbing and drying tower acids. The stacks, spaced on 28-in. centers, are supported 13 ft. above ground and rise to a height of 23 ft.

The same recirculating system handles two other coolers. One of these is a separate group of NR cooling sections for a 66-Be. product from dilution of the cooled absorbing tower acid. It has three stacks 14 sections high arranged for parallel flow. The other is a submerged lead coil cooler for 60-Be. acid made from cooled 66-Be. acid.

Water recirculates in the cooling system. Water for all four coolers comes from a common tank. Gravity returns the warm water to the same tank.

An after-cooler (with 32 sections in two stacks in series) completes the cooling of the final product. It delivers 60-Be. acid at 90 deg. F. to storages.

Makeup water is softened with zeolite and given a Betz "Dianodic" corrosion inhibiting treatment with phosphate and chromate compounds. This gives a pH of about 6.5.

The 98 percent acid normally enters the cooling coils at 180-190 deg. F. and flows at 300 gpm. through each of the parallel banks of cooling stacks. Feed acid may be as high as 240 deg. F.

Designed exit temperature is 140 deg. F. for the drying tower acid and 150 deg. for absorbing tower acid (without allowing for cooling by evaporation during free fall of the water to the catch basin). Exit acid has been as low as 120 deg. in winter.

About 8 tons per hour of 66-Be acid is cooled from 220 deg. to 140 deg. and 10 tons per hour of 60-Be acid from 260 deg. to 130 deg.

The water system was designed for a flow of 1,000 gpm. with a calculated makeup of 40 gpm. to replace evaporation and blowdown at maximum summer temperature and humidity. The unit has not yet operated under these conditions, but at near-zero atmospheric temperature the flow was 400 gpm. with a makeup of 20 gpm.

Circulating water temperature was 85-90 deg. F. Indianapolis city makeup water entered the softeners at 60 deg. The system was designed to run at an average water temperature up to 125 deg. on the sections.

NEW STEAM CONDENSER

Marion now plans to use National Radiator cooling sections to condense blowdown steam from the boilers.

(*Continued*)

NEW TRANE BRAZED ALUMINUM SURFACE

MORE HEAT TRANSFER EFFICIENCY

in $\frac{1}{4}$ the space

with $\frac{1}{3}$ the weight

at $\frac{1}{2}$ the cost

A Smaller Unit Can Do A Bigger Job

More heat transfer from every cubic foot of space, more Btu's from every pound of surface, more Btu's per dollar—with the new Trane Brazed Aluminum Heat Transfer Surface.

Many of these Brazed Aluminum Units can pack *450 square feet* of heat transfer surface—working surface—into *one cubic foot*. That's up to *nine times* more surface than a shell-and-tube unit with ¾" tube can put into the same space.

In a given space, the units can meet practically any specifications of heat transfer, pressure drop, volume, number and direction of passes, and fluid velocity.

All aluminum, the units are much lighter than shell-and-tube heat exchangers—often needing only ¼ the weight to do the same job.

The units handle as many as five liquid or gas streams at once. Headers can be designed for any job.

Trane Brazed Aluminum Surface, evenly brazed in an exclusive flux bath process, is as rugged as it is flexible—it takes test pressures up to 1,000 lbs. per square inch, temperatures from −300°F. to 500°F.

Because they pack so much heat exchange surface into every cubic foot, and because of advanced manufacturing techniques, the units are much less costly than conventional equipment—a smaller unit can do a bigger job. *Trane Brazed Aluminum Units can often do the same heat transfer job as tubular exchangers that cost two or three times more.*

If you have a heat transfer job—one that demands a large number of units—Trane Brazed Aluminum Surface may be the answer. Contact your nearest Trane sales office, or write direct.

Large units—left, or small—at right, flexible Trane Brazed Aluminum Surface provides heat transfer efficiency.

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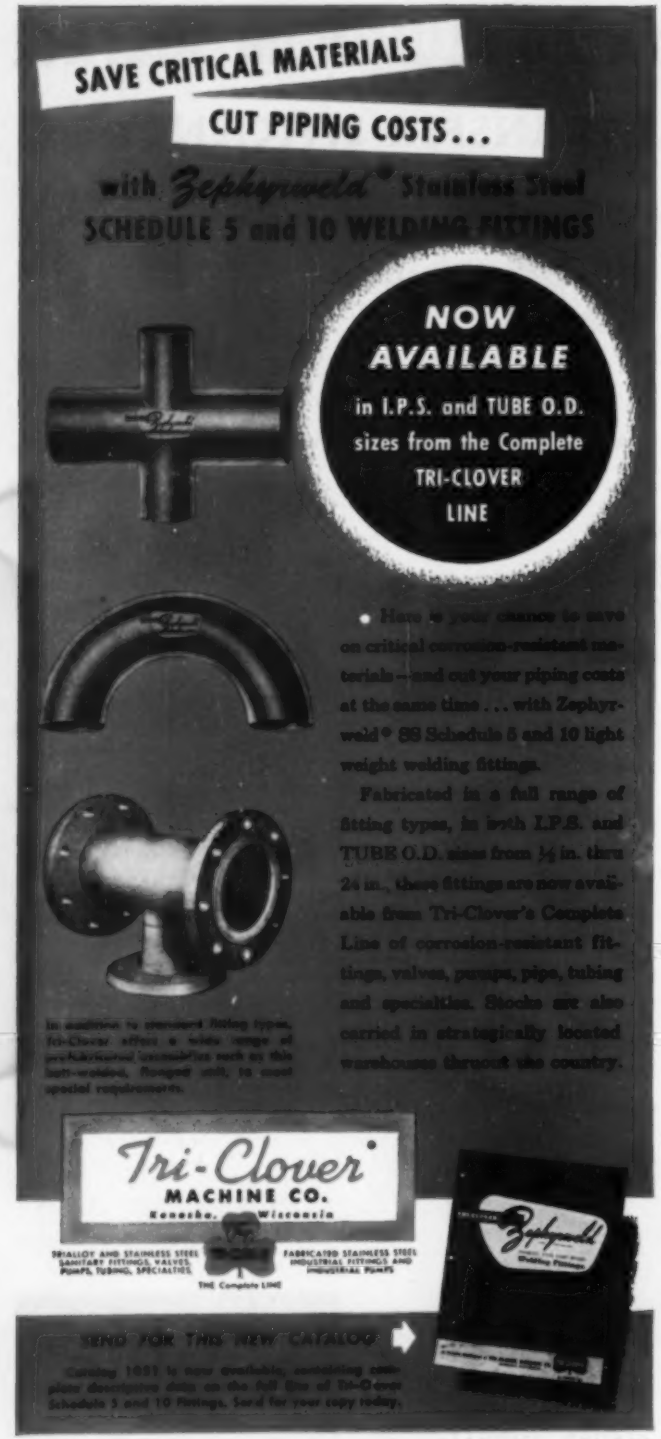
Eastern Mfg. Division . . . Scranton, Pennsylvania
Trane Company of Canada, Ltd. . . . . Toronto
OFFICES IN 80 U. S. AND 14 CANADIAN CITIES

TRANE

MANUFACTURING ENGINEERS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT


SAVE CRITICAL MATERIALS
CUT PIPING COSTS...
with Zephyrweld® Stainless Steel
SCHEDULE 5 and 10 WELDING FITTINGS
NOW AVAILABLE
in I.P.S. and TUBE O.D. sizes from the Complete TRI-CLOVER LINE
• Have a your chance to save on critical corrosion-resistant materials—and cut your piping costs at the same time . . . with Zephyrweld® SS Schedule 5 and 10 light weight welding fittings.
Fabricated in a full range of fitting types, in both I.P.S. and TUBE O.D. sizes from ¼ in. thru 24 in., these fittings are now available from Tri-Clover's Complete Line of corrosion-resistant fittings, valves, pumps, pipe, tubing and specialties. Stocks are also carried in strategically located warehouses thruout the country.
In addition to standard fitting types, Tri-Clover offers a wide range of pre-fabricated assemblies such as this butt-welded, flanged unit, to meet special requirements.
Tri-Clover®
MACHINE CO.
Kenosha, Wisconsin
SEND FOR THIS NEW CATALOG

NEWS, cont. . .

This cooler will have 150 sections in 10 stacks of 15 sections each. It will recover 7,000 lb. of 5-psi. steam per hour that has until now gone into the atmosphere.

Cooling water makeup will be the blowdown tapped from the line that supplies the spray nozzles of the 98 percent acid coolers.

Thus waste cooling water and blowdown from the condenser system will give a maximum of cooling through two systems and will go to the sewer near its boiling point. Recovered steam will have the high quality of distilled water—thus cutting the cost of treating the boiler makeup.

Equipment Sales Engineers Organize in New York

A group of sales engineers in the chemical equipment field, who have been meeting informally in New York since December 1950, have organized the Chemical Equipment Sales Engineers Association. First officers elected are Kenneth S. Valentine of Patterson Foundry & Machine Co., president; J. Robert Powers, Baker-Perkins Co., vice president; Laurence C. Johnston, Brown Fintube Co., secretary-treasurer.

Membership at present is limited to qualified sales engineers in the New York district. Current problems are discussed informally at luncheon meetings each month at the Chemists' Club. Guest speakers are frequently invited to these meetings. A recent meeting was addressed by Cecil H. Chilton of *Chemical Engineering*. His topic: cost estimation.

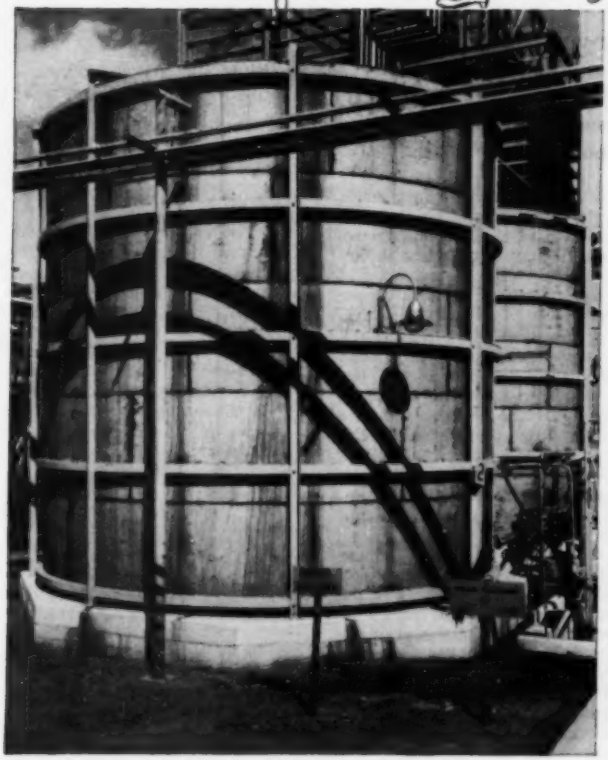
Charter members include: H. B. Caldwell, vice president, Swenson Evaporator Division, Whiting Corp.; Ernest H. Chapin, Foster Wheeler Corp.; J. C. Coleman, F. J. Stokes Machine Co.; J. T. Costigan, Sharples Corp.; C. W. Crumb, Oliver United Filters; J. J. Hickey, Pfaudler Co., Henry W. Hitzrot, Dorr Co.; L. C. Johnston, Brown Fintube Co.; S. B. Kanowitz, Raymond Pulverizer Division, Combustion Engineering-Superheater, Inc.

Also: W. D. Kohlins, Buflovak Equipment Division, Blaw-Knox Co.; Emerson Lyons, Turbo-Mixer Corp.; Charles A. McBride, J. H. Day Co.; Glenn J. Moorhead, Mixing Equipment Co.; J. R. Powers, Baker Perkins Co.; H. M. Small, Filtration Engineers, Inc.; James Sweeney, Struthers-Wells Corp.; K. S. Valentine, Patterson Foundry & Machine Co.; and W. H. Withington, Hardinge Co.

(Continued)

STAINLESS ONLY THIS | STEEL WALLS THICK . . .

resist attack of 55-60% Nitric Acid at Phillips Chemical's Ammonium Nitrate Plant



THESE TWO 20' x 20' nitric acid storage tanks at Phillips Chemical Company's Ammonium Nitrate Plant, Etter, Tex., offer striking proof of the exceptional strength and corrosion resistance of U·S·S Stainless Steel.

Walls of the tanks are 12-gauge Stainless sheets—only 1/10 inch thick; tops and bottoms are fabricated from slightly heavier 10-gauge Stainless sheets. Yet they hold a 55-60% concentration of nitric acid, and have been in service for 16 months without a single repair.

Nitric acid is pumped to these tanks through Stainless Steel pipe from the nitric-producing unit a mile away. Here again, Stainless Steel's resistance to corrosion made it a must for the job.

The outstanding service that Stainless gives under the severest conditions of corrosion is important anytime, but especially valuable in the face of today's material shortages. So include Stainless equipment in your plans for the future. And be sure you get perfected, service-tested U·S·S Stainless Steel . . . it will give you the finest performance.

Nitric acid tanks at Phillips Chemical's Ammonium Nitrate Plant are built of light-gauge Stainless sheets and are supported by a structural framing of carbon steel.

AMERICAN STEEL & WIRE COMPANY, CLEVELAND · COLUMBIA STEEL COMPANY, SAN FRANCISCO
NATIONAL TUBE COMPANY, PITTSBURGH · TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM · UNITED STATES STEEL COMPANY, PITTSBURGH
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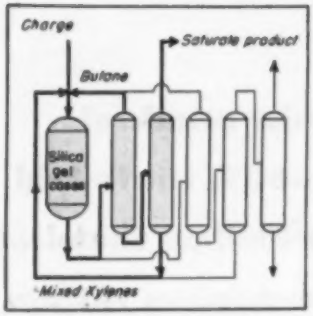
USS

U·S·S STAINLESS STEEL

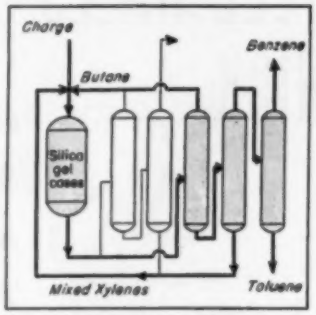
SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

5-1110

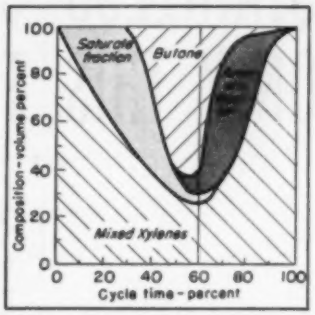
UNITED STATES STEEL



60 PERCENT of time effluent from gel case goes to the saturate receiver.



40 PERCENT of time effluent goes to columns that separate the aromatics.



SWITCH to aromatic receiver comes after about 60 percent of cycle time.

Adsorbing Aromatics

Chromatography gets its first big job in refining. It separates xylenes, toluene and benzene by selective adsorption from the liquid phase. Here's how.

Its new Arosorb process will be used by Sun Oil Co. to separate aromatics at an $8 million plant to be built at Sun's Marcus Hook, Pa., refinery. The process separates aromatics by selective adsorption from the liquid phase, using silica gel. It's highly versatile, and is expected to be used in the purification and recovery of other chemicals.

Although Sun will couple its Arosorber with a 10,000-bbl.-per-day Houdriformer, any of the new catalytic reforming processes could be used. Catalytic reforming converts naphthenes into aromatics. These are distilled to provide an aromatic-rich feed for the Arosorber. Its job is to separate the aromatics. Final fractionation then produces specification products.

The new plant will produce 13 million gallons per year of benzene, 30 million gallons of toluene and 15 million gallons of xylenes.

Sun's Arosorb process will be the first for separating comparatively low-cost aromatic hydrocarbons on a large commercial scale by selective adsorption with silica gel.

The new unit at Marcus Hook will have six silica gel cases, each 10 ft. in diameter and about 20 ft. high. They will contain a total of 500,000 lb. of gel. The gel will be protected from moisture and other poisons by pretreating it in regenerative dryers on each of the three streams feeding the cases. After about a year, gel will be discarded. Gel will be replaced in one case at a time so operation will not be interrupted.

Each silica gel case will go through 15 cycles daily or one about every 100 min. The cycles are staggered to keep the rest of the plant in virtually continuous operation.

In the process, the aromatic stream passes through a bed of silica gel, and the aromatics are adsorbed. When the bed nears saturation, feed is shut off and the bed desorbed. Butane, the first desorbent, washes out saturates left from the charge stock. Then a stream of mixed xylenes, used as the other desorbent, gradually displaces the aromatics adsorbed on the gel. When desorption is substantially complete, charge stock is readmitted and the cycle repeated.

In actual operation the flow through the case is continuous and there is a gradual increase and decrease of the various components in the effluent.

Cyclic operation of the gel cases is automatically controlled. A meter in the effluent line from each case keeps the flow rate constant. Thus the quantity of charge and of desorbents can be controlled wholly by a cycle timer that also keeps the operation of the six cases staggered.

Effluent is accurately and automatically cut from the saturate to the aromatic product line by an instrument developed by Sun. It measures the refractive index of the effluent, and is adjusted to switch the product valves at predetermined times after the refractive index of the effluent passes through a minimum.

Since the aromatic and saturate streams both contain the butane and mixed xylene desorbents, they are each sent to two distillation towers to recover these desorbents.

Here's how the Arosorb process will function at Marcus Hook (see flowsheet). The feed stock and the two desorbents in the right sequence enter the top of the case through the inlet manifold. The saturate effluent flows to a train of two distillation columns in the first of which butane is removed as an overhead product and recycled. The saturate part of the charge is recovered overhead in the second fractionator, with mixed xylene desorbent as a bottoms that is also recycled.

The aromatic effluent is similarly handled except that, since a mixture of benzene and toluene will be processed, a third tower is added to the train to act as a benzene-toluene splitter. The recovery sequence can be altered to meet changing economic conditions or the requirements of a particular refiner.

For a feed containing 35 percent aromatics, about 2 bbl. of mixed xylenes and 0.5 bbl. of butane will be required per barrel of charge. This is equivalent to a solvent dosage of 250 percent in a solvent refining process. But in the Arosorber, four-fifths of the "solvent" is taken as a bottoms product and does not need to be distilled. The ratio of desorbents to charge would decrease with a lower aromatic content feed and increase with a higher aromatic feed. Desorbents are hydrocarbon streams having boiling points different from those of the charge stock.

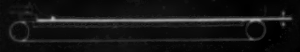
Recovery of aromatics is high, but is diminished somewhat at very high levels of purity. At 90 percent purity, for example, recovery of aromatics is 98 percent, while at 98 percent purity the yield drops to 90 percent.

The Arosorb process turns out specification benzene and toluene. All that is usually required is a light sul-

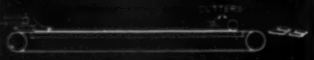
Some of the functions that have been successfully performed by Sandvik Conveyors

WITH A SANDVIK WATER-BED CONVEYOR YOU CAN

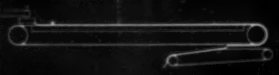
COOL AND CONVEY



REGULATE THICKNESS WHILE COOLING (ANY THICKNESS UP TO 1" CAN BE COOLED)



CUT MATERIAL TO DESIRED SIZES WHILE COOLING



COOL AND STRIP OFF GELATINOUS MATERIALS IN SHEET FORM

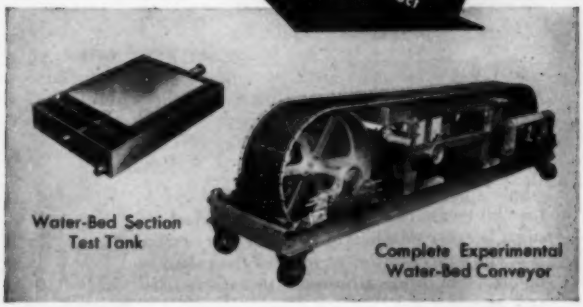
COOL LOOSE AND PULVERIZED MATERIALS

COOL SOLIDS IN SHEET FORM

COOL MATERIAL IN LAYERS

HOW CAN SANDVIK'S NEW COOLING CONVEYOR *Improve YOUR production?*

HERE ARE TWO WAYS To "Pre-Test" Sandvik's Steel-Belt, Water-Bed Conveyor With Your Own Product



Water-Bed Section Test Tank

Complete Experimental Water-Bed Conveyor

With one of these experimental units you can find out how Sandvik's patented water-bed conveyor can make your processing more automatic.

A small scale trial in your plant will enable you to determine cooling rates and other pertinent data. You will see for yourself the extraordinary cooling capacity of this conveyor combined with the advantages of the steel belt.

How The Water-Bed Conveyor Operates—The loaded steel band "floats" along on an open trough of circulating water. The water pressure assures 100% coolant contact with the belt. The trough is so designed that no water can get on top of the belt.

Experimental water-bed units are available on request. Sandvik's engineering department will help you decide which test unit is best suited for your purpose. Write, wire or 'phone for complete details.

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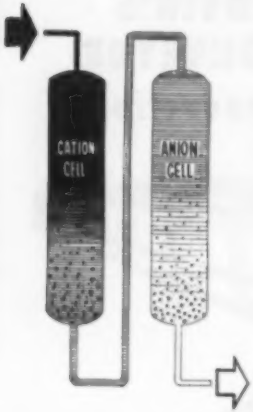
Manufacturers of Steel-Belt Conveyors For Over 30 Years

SANDVIK STEEL BELT CONVEYORS

SS-64

"Sure we can wash magnesium hydrate"

(see opposite page)



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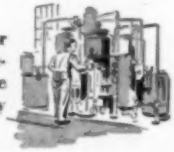
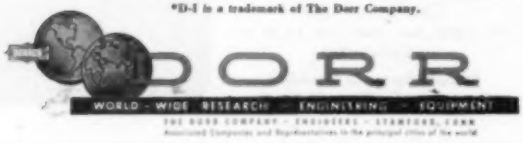


WILL WORK WITH YOU
on any phase of your ion-exchange program — whether it involves established principles or a new and confidential process?

If you are currently exploring the possibilities of ion-exchange for new processes or those already established we believe you will find our service helpful. And our ion-exchange facilities are backed by solid chemical engineering knowledge.

Bulletin #4081 hits the high-spots of Dorrco D-I Systems. Write to Ion-Exchange Sales, The Dorr Co., Barry Place, Stamford, Conn.*

*D-I is a trademark of The Dorr Company.



phuric acid treatment to meet the acid wash specification. Not much acid is required as olefins, which cause off-test acid wash, are largely rejected to the saturate product in the process.

How much does an Arosorber cost and what does it cost to operate one? Allowing for overhead, taxes, maintenance and depreciation in 10 years, a 1,000-bbl.-per-day unit would cost $1.2 million, could produce aromatics at an operating cost of 6.5 c. per gal. A 2,000-bbl. plant would require an investment of $1.9 million; it could operate at a cost of 5 c. per gal. of aromatics.

Both Houdry Process Corp. and Universal Oil Products Co. will license the process under Sun patents.

Heyden to Double Production Of Dye Products for the Army

Heyden Chemical Corp. has started construction on a new plant at Fords, N. J. It will double its capacity for production of ortho-chloro-benzaldehyde and ortho-chloro-benzoic acid. The new plant will be completed next month.

The two chemicals are important in making chrome dyes for the Army's khaki uniforms. They are also used in the production of dyestuffs and pigments for civilian use.

PLANNED PIPING . . .

. . . on five different levels below the basement ceiling of Upjohn Co.'s new process building at Kalamazoo, Mich. Main floor slabs has some 25,000 pipe sleeves on 4-ft. centers. More than 1,000 tons of piping has been suspended from it. These arrangements, engineered by Austin Co., will make it easy to add processing equipment without disturbing the floor slab or the present piping setup.

RAW MATERIAL shortage will never hit the Northwest Magnesite Company's Cape May, New Jersey plant, for its basic source of supply is seawater—its basic end product, magnesia. In this utilization of modern processing techniques to tap the virtually unlimited chemical resources of the sea, sedimentation is of primary importance.

At Cape May, the jobs of preliminary treatment of seawater and subsequent thickening and washing of magnesium hydrate are carried out in Dorr Thickeners—six of them, ranging from 150 to 320 feet in diameter.

It is particularly significant that these steps are handled by Dorrs at every major seawater magnesia operation in the U. S. . . . regardless of whether the end product is refractory, metal or both.

No matter what the application, when you need thickeners it will pay to check Dorr . . . the oldest manufacturer of sedimentation equipment *with the newest ideas.*

BETTER TOOLS *today* TO MEET TOMORROW'S DEMAND

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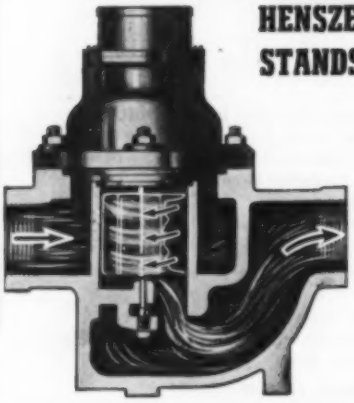
FOR THOSE FASTENERS YOU NEED
THAT *MUST* BE RIGHT—
SPECIFY JAQUES

When high standards dictate the fastening of aluminum with aluminum, JAQUES nuts, bolts, screws, etc., are the answer. Cold-headed and heat-treated, JAQUES aluminum fasteners are light, strong, and durable.

All non-ferrous metals and alloys, incuding naval brass, silicon bronze and monel, can be furnished in standard and special parts.

JAQUES Company
71B BATTERYMARCH STREET, BOSTON, MASSACHUSETTS



HENSZEY *Feed Water* METER STANDS UP *where others* FAIL

The cutting, abrasive action of hot, dirty Boiler Blowdown quickly breaks down meters that depend upon close clearances and intricate parts for their accuracy. Henszey Meters stay accurate—stay on the job—accurately measuring Boiler Blowdown, Feed Water Condensate, FREE-RUNNING CHEMICALS and other "hard-to-measure" liquids. For details consult Sweet's Catalog or write:

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FEED WATER METERS

Continuous Blowdown • Distillation Systems • Heat Exchangers
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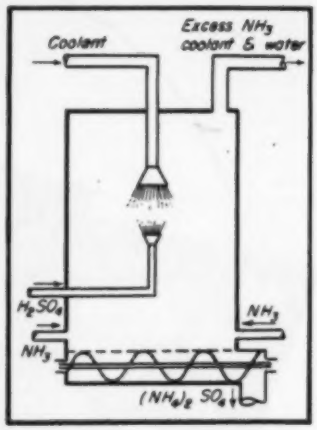
also MILK EVAPORATORS and PRE-HEATERS



Sprayed Coolant Clue to Better Sulphate Process

A new process, developed by Socony-Vacuum Oil Co., produces substantially dry, free-flowing ammonium sulphate; it may cut the cost of that fertilizer. A coolant sprayed into the reactor (see cut) absorbs the heat from reaction of ammonia and sulphuric acid. The process might also be used for other exothermic reactions where solids or high-boiling liquids are produced along with gaseous products.

Concentrated sulphuric acid (80 to 100 percent) is sprayed into an atmosphere of ammonia. The ammonium sulphate, as it forms, is sprayed with a liquid coolant having a boiling point not greater than 240 deg. F. Enough coolant is used to keep the temperature in the reactor between 250 and 300 deg. F.

Coolant can be water, liquid ammonia, toluene, butane, or such hydrocarbon fractions as petroleum ether. Toluene works best; it doesn't cause the corrosion problems that water does.

Since coolant contacts the product as soon as it's formed and absorbs the heat of reaction, there's no chance for the ammonium sulphate to melt and re-solidify, this being one interfering factor in getting a free-flowing product.

Liquid coolant contacts, not the sulphuric acid, but the product, so there's no dangerous heat evolution and no reaction between acid and coolant. Hence concentrated acid can be used.

Up to now, it's been hard to control the heat evolved when ammonia reacts with sulphuric acid, especially concentrated acid. What's more, heat had to be applied in the concen-

trating and drying of the ammonium sulphate crystals. And when dilute instead of concentrated sulphuric was used, costly corrosion-resistant equipment was required.

Other possibilities of the new Socony process: neutralization reactions of an acid and a base with formation of salt; and limited oxidation of hydrocarbons, for example, reaction of methyl naphthalene with air to form the corresponding solid naphthoic acid.

Major Producers to Boost Output of Scarce Styrene

Styrene capacity will be greatly increased when three producers bring new facilities just authorized by Defense Production Administration into operation.

Koppers Co. applied for a certificate on a $4,704,000 plant at Port Arthur, Tex., to make ethyl benzene, was allowed $4,475,355, and granted a 70 percent writeoff.

For styrene itself, Monsanto Chemical Co. got the go-ahead for a $8,600,000 plant at Texas City and Dow Chemical Co. for a $1,610,000 facility at Freeport, Tex. Two styrene projects were authorized for Koppers Co. at Kobuta, Pa., one for $3,691,000 and the other for $320,267. All of these styrene facilities got 70 percent writeoffs.

Methyl styrene will be made by Dow at Midland, Mich., in a new $10,241,400 plant that was given a 60 percent allowance.

Stainless Digester Added As Rayonier Revamps Mill

A ninth pulp digester will go into operation shortly at the Port Angeles, Wash., mill of Rayonier, Inc. It will be the second digester with a stainless steel lining to be installed at the mill.

While the new digester will increase output, its prime purpose is to enable Rayonier to keep eight digesters in operation at all times. Each of the seven old type digesters has to be shut down periodically to renew the brick lining.

An additional 12 x 12½-ft. washer will be installed to improve pulp quality. The old wooden "beer keg" will be replaced by a new concrete tile-lined chest. Other replacements: a new vacuum washer and a new faster winder for the finishing room.

Previous improvements included replacement of an old wood stave tower by a new steel chlorinator tower lined with Saran rubber, addition of a barker pump and motor, a larger chipper motor and two machine stock chests. (Continued)

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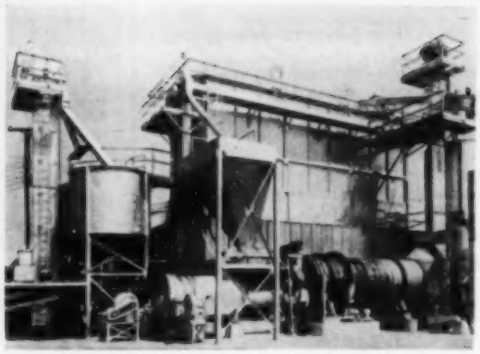

MECHANICAL drying takes place in Rotolouvre dryer.

New Look In Silica Gel Plants

California plant puts nature to work: Desert sun and fresh air used to dry wet gel.

Even the sun works at the new silica gel plant of Culligan Zeolite Co. in San Bernardino, Calif., on the edge of the Mohave Desert. Heat from the sun dries the gel, slashing dollars and cents from processing costs and increasing output. Silica gel is urgently needed right now as a desiccant for the moistureproof packaging of military materiel.

Now turning out silica gel at a record rate of 3 million pounds a year, the new $100,000 plant reached full production just four months after construction began. And if defense and shipping demands grow, its output can be doubled.

Culligan built the plant to produce a desiccant that meets the specifications for Method II packaging. In this method, required by the armed forces, valuable military equipment is protected from moisture, corrosion and mildew by sealing it in a moisture vapor barrier, either flexible or rigid, that contains silica gel to adsorb moisture. So porous is silica gel that a cubic inch has an acre of adsorption surface. It can adsorb up to 40 percent of its own weight without liquefying.

Everything from aircraft engines to instruments and even delicate electronic crystals is protected by silica gel. Greasing is eliminated. Thus millions of man-hours previously spent in that bane of GI existence, degreasing equipment, are freed for other duties. What's more, equipment is now ready for operation much sooner.

Solar dehydration is but one feature of the Culligan plant. It is also highly mechanized, with much equipment on wheels. This helps to achieve the high productivity. It takes not more than 15 employees to produce, bag and ship an entire month's production.

The plant is only 65 mi. from a source of sodium silicate, the raw material arriving at San Bernardino in the biggest tonnage. Sodium silicate and sulphuric acid come in tank trucks, and are stored in tanks at the top of the pouring tower. In measuring tanks just below, sulphuric, silicate and diluting water are proportioned.

Sulphuric acid and sodium silicate react to form sodium sulphate and silicic acid in the agitated silica gel sol mixing tank. From this tank the solution is discharged into casting tubs, where it gels in about 4 hr. to a mixture much stiffer than household gelatin.

Next, the gelled mixture is dumped through a 1-in. mesh screen that breaks it up, and falls into washing carts. Softened hot water runs through eight washing carts connected in series and carries away the sodium sulphate in the waste water.

Washed gel is transferred to a truck that carries it out to the drying basins for dumping and spreading. Culligan has 37 acres of these concrete drying beds at San Bernardino, where solar dehydration was originally developed by the company for drying zeolite. It takes an average of 5 days under the sun to dry the silica gel, but this depends on the weather and the season. In the Mohave, the ambient temperature often reaches 115 deg. F. with 5 to 10 percent relative humidity. Using the sun's heat means big savings in production costs. The drying beds can be used for 10 months of the year.

Dried gel is swept up by power-driven rotary brushes on a mechanical sweeper, loaded into a truck and taken back to the plant. There, the truck dumps it into a hopper, and an elevator takes it up into the storage tank.

From storage the silica gel goes to a Rotolouvre dryer to be activated. This dryer is 6½ ft. in diameter and 16 ft. long. It consumes 96 million Btu. daily. The dryer takes in 72,000 lb. a day, heats the gel to 1,000 deg. F. and drives 24,000 lb. of water from it, expelling 48,000 lb. daily of activated silica gel at 450 deg. F. The 6 to 80 mesh granules are stored until bagged and shipped via rail.

The new plant is also adapted to regenerating spent silica gel. During World War II, Culligan pioneered in the reactivation of spent gel, saving the government millions of pounds of vital chemicals and the cost of producing 8 million pounds of new gel.

Another Ammonia Plant for Shell Chemical on West Coast

A new synthetic ammonia plant will be built by Shell Chemical Corp. at Dominguez, Calif., to supply nitrogen fertilizer to farmers in Arizona, California, Oregon and Washington. Raw materials for the synthesis of ammonia will be natural gas and air. The multi-million dollar plant is expected to be completed late in 1952.

Shell Chemical currently operates at Pittsburg, Calif., near San Francisco, the biggest ammonia plant west of the Rockies. Bulk of the output is used directly as a nitrogen fertilizer to increase yields of grain, cotton, vegetable and fruit crops. Anhydrous ammonia is injected directly into the soil or dissolved in irrigation water

(*Continued*)

Attention!

OPERATORS OF CONDENSERS

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Add all these advantages that Trufin offers you—space saving, capacity increase, production gain, improved operating efficiency, lowered maintenance cost, less "shut down" time, and many more—you can recognize the wisdom of specifying Wolverine Trufin for your next retubing job.

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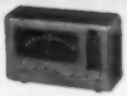

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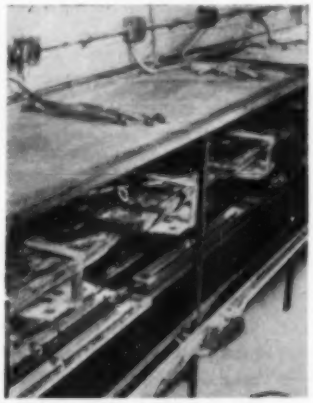
YARWAY STRAINERS

that carries it to the roots of the crops. This application of ammonia was pioneered in California. It has been so successful in boosting crop yields that ammonia demand far exceeds the present supply. Direct injection of ammonia—the richest source of nitrogen—into the soil has spread from the Pacific Coast states and Arizona to many states in the South and Midwest.

The government has certified Shell Chemical's new ammonia plant as a necessary defense project. In addition to its effect in boosting production of foodstuffs, the plant will also provide ammonia for the manufacture of munitions, nitric acid, commercial explosives, paper pulp and other industrial needs.



CURING oven, 42 ft. long, uses infrared.

Infrared Cures Rubber Faster; Cuts Product Rejects

These are the two big reasons why Lien Rubber Mfg. Co. of Los Angeles is sold on its new infrared system for curing latex foam sponge rubber. Until recently, the firm used a hot water curing system.

What's more, Lien's production men have found out that the all-metal radiant heaters have another advantage: they can take rough handling and splashes from passing molds.

In the new infrared set-up—one of the first in the country's lusty foam rubber industry—the latex foam compound is poured into aluminum molds, then conveyed at once through the 42-ft. curing oven (see *cut*). The oven has 30 1.8-kw. Chromalox electric radiant heaters supplied by Edwin L. Wiegand Co. of Pittsburgh.

The oven has three zones: the first gives fast heating, the second adjusts

SPONGE mold output jumps 42 percent.

the mold temperature to 200 deg. F., the third holds this temperature. Equal distribution of the heaters at top and bottom throughout the oven gives uniform heating of the molds. Each zone has twice as many heaters as the one that follows. Input controllers keep the temperature within close limitations.

After leaving the oven, the molds are water-cooled down to about 70 deg. F. The latex product is then taken out (see *cut*).

Lien Rubber's new curing system speeds up the plant's output: from 384 molds per 24-hr. day by the hot water method to 400 molds per 16-hr. day at present. Since there is no longer danger of water spots, rejects of finished product have been slashed.

South Texas Section of AIChE Will Hold Annual Meeting

Over four hundred executives, chemical engineers, and students from Gulf Coast industries and universities are expected to assemble in the Hotel Galvez, Galveston, Tex., on October 19 for the sixth annual technical meeting of the South Texas Section of the American Institute of Chemical Engineers.

The all-day program will include three technical sessions, a student session, 25 industrial exhibits, a cocktail hour and an evening banquet. Francis J. Curtis, vice president of Monsanto Chemical Co. and former president of the AIChE, will be the banquet speaker.

Technical sessions will include discussions of catalytic reforming, waste disposal, and heat transfer. The student session program has been aimed at acquainting senior chemical engineering students with their prospects and problems after graduation.

A Colmonoy Hard-Facing Application

Thermocouple Wells Hard Faced with SPRAYWELDER last 7-10 times longer

The fast destruction of thermocouple protection tubes may now be prevented by the use of a remarkable hard-facing alloy and a metal-spray welding method called the COLMONOY SPRAYWELD PROCESS.

The photograph shows a thermocouple protection tube, made of inexpensive mild steel, mounted on a lathe. A powder spray gun, the Spraywelder, is spraying COLMONOY No. 6, an extremely erosion, oxidation, and corrosion resistant nickel alloy. After spraying, the deposited alloy is fused to the base metal with an oxy-acetylene torch. The result is a smooth, welded overlay, as shown on the tubes above. When placed in service, tubes like these have given from seven to ten times the life of tubes previously used.

The COLMONOY SPRAYWELDER has many profitable uses in the process industries. While the method illustrated above lends itself especially to cylindrical parts, such as pump shafts,

sleeves, plungers, pistons, etc., any part, regardless of shape and contour, may be sprayed. Because the overlay may be held to within .010" of the desired size, less alloy is used and far less grinding is required than with other hard-facing methods. The Spraywelder may also be used as a standard metallizing gun, will spray copper, aluminum, stainless steel, etc.

COLMONOY No. 6 has many other applications. In the form of gas welding rods it is used for hard-facing valves, valve seats, pump seal and wear rings. COLMONOY No. 6 may also be cast for small precision parts.

COLMONOY is a complete line of hard-facing alloys, made to resist impact, abrasion, and corrosion, singly or in combination. To accomodate application methods, they come in various forms: powder, rods, electrodes, paste, and metallizing wire.

Write and ask for more information: about COLMONOY alloys, about equipping yourself with a Spraywelder, or for the name of your nearest Sprayweld shop.

WALL COLMONOY
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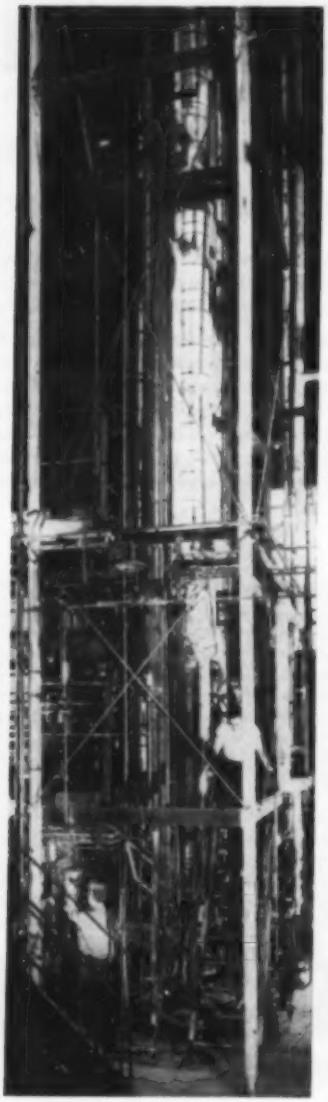
HARD FACING ALLOYS

From Pilot Plant to Payoff

Fluid catalyst replaces fixed bed in Kellogg's new catalytic reforming process. Refiners will use it to convert low-octane naphthas into aviation gas and aromatics.

Fluid Hydroforming is fast catching on with refiners. Even while the world's first commercial plant was still on the drawing boards, and within a month after M. W. Kellogg Co. first disclosed the new process, two more large-capacity units had been ordered.



The new process applies the fluid catalyst principle to the reforming of naphthas. Refiners see in it the answer to one of their major current problems: upgrading low-octane naphthas to high-octane products.

The world's first Fluid Hydroformer, designed and engineered by Kellogg, will convert 55 octane naphthas into 98-175 octane aviation gasoline. The plant, a 2,000-bbl.-per-day unit, will be located at the Destrehan, La., refinery of Pan-Am Southern Corp.

In addition, Kellogg is at work on the design and engineering of two more of the fluid catalytic reforming units for Cities Service. One, to be built at Lake Charles, La., will process 20,000 bbl. per day, while the other, at East Chicago, Ind., will handle half that volume.

The new Fluid Hydroforming process, result of extensive development work by Standard Oil Development Co., Standard Oil of Indiana and Kellogg, radically improves the economics of the basic catalytic reforming process by utilizing the fluid catalyst principle. In these new units the catalyst, instead of being held in reactors, is finely powdered and moves continuously through the system supported on oil vapors and air. Shutdowns to regenerate catalyst are eliminated. What's more, the actual catalytic reaction is improved because the finely powdered catalyst provides better catalyst-oil contact than the pelletized variety used in fixed bed reactors.

Kellogg's new process has many advantages over the fixed bed hydroformers used during World War II to provide vast quantities of toluene and aviation gasoline. In these earlier hydroformers, reaction beds had to be alternately taken out of production while the catalyst was regenerated. The new fluid catalyst system continuously withdraws catalyst from the reaction zone and regenerates it simply and cheaply. Daily operating costs will be about 30 percent lower than those of a fixed bed with the same capacity. Furthermore, Kellogg estimates this new type of unit will cost one-third less to build for equivalent capacities.

Yields will be 3 to 5 percent higher than for a fixed bed, according to data from Kellogg's pilot plant (see cut). This is principally due to the uniform nature of the reaction, a result of the uniform temperature throughout the fluid bed. Reactor pressures are also moderate in comparison with other catalytic reforming processes. As a result, the process shows better liquid recovery. The final gasoline product also contains less butane. This means the refiner can advantageously blend butanes from other refinery sources into the hydroformed gasoline in bringing it up to the permissible 10-lb. Reid vapor pressure.

In operation, fresh feed is charged to an absorber from which it passes through exchange to the main heater where its temperature is raised to about 950 deg. F. From there the feed is charged to the base of the reactor in which the fluid bed is maintained. The vaporized naphtha passes up through the bed, where the hydrocarbon molecules are reformed from straight-chain paraffins to ring-type aromatics, and into the separation section above the bed level. After passing through cyclones at the top of the reactor to remove entrained catalyst, the reformed hydrocarbon vapors are transferred to the main fractionating tower and introduced at a point just above the slurry settler.

Taken off as bottoms from the tower is a small amount of relatively high boiling polymer made during the processing. This is charged to a flash drum and recovered separately for petrochemical processing.

Principal product leaves the fractionator overhead and goes to a high-pressure receiver that separates the hydrogen-rich gases from the gasoline. The gasoline is stabilized and sent to storage. The gases, after passing through heat exchangers, are recycled to the base of the reactor to maintain the required hydrogen-rich condition in the reaction zone.

Movement of the fluid catalyst is similar to that in fluid catalytic cracking. From the reactor it passes through a stripper to remove and save hydrocarbon product and is then charged to the regenerator. There coke is burned off before it is returned to the reactor. Heat generated in regeneration is used to produce process steam through the use of an integrally contained boiler.

Varying operating conditions produce different yields and octane ratings. Under severe operation, the clear octane rating of the product is 95 CFR-R, without any tetraethyl lead. Operating for the prime purpose of producing aviation gasoline base

(Continued)

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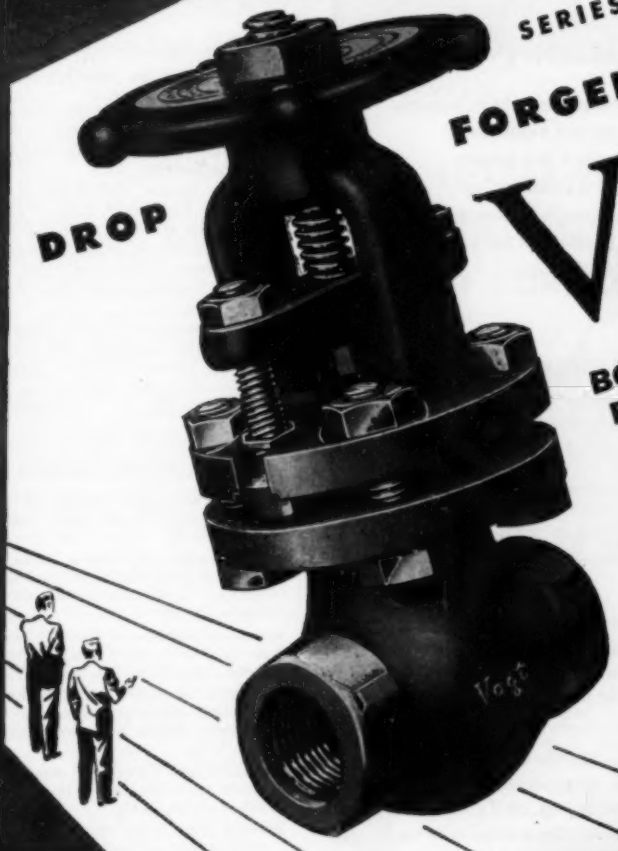

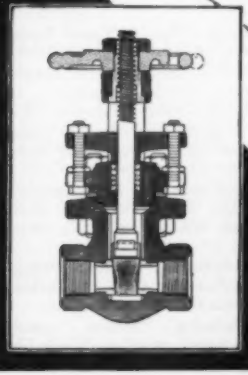

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stocks, the process can produce fuels with aviation octane ratings of 98, F-3 and over 175, F-4, with the addition of 4.6 cc. of TEL per gallon. In actual refinery practice, through blending of butanes from other sources, the total volume of finished gasoline approximates 100 percent of the liquid charge volume.

Kaiser's New Gypsum Plant To Be First in Northwest

First complete gypsum products plant in the Northwest will be built by Kaiser Gypsum on a nine-acre location near Seattle.

Kaiser bought the property for $100,000. Eventually, a $2.5 million unit will be erected. It will consist of a three-kettle calcining plant and a gypsum board plant capable of producing 100 million square feet of gypsum per year.

Raw gypsum will come from deposits on the company's San Marcos Island, off Lower California. Kaiser's specially equipped Liberty ship will haul it to Seattle. *(Continued)*

CONVENTION CALENDAR

American Oil Chemists' Society, fall meeting, Edgewater Beach Hotel, Chicago, October 8-10.

World Metallurgical Congress, in conjunction with National Metal Congress and National Metal Exposition, Detroit, October 15-19.

American Association of Textile Chemists & Colorists, annual meeting, Statler Hotel, New York, October 17-19.

Association of Consulting Chemists & Chemical Engineers, annual meeting, Shelburne Hotel, New York, October 23.

National Paint, Varnish & Lacquer Association, Chalfonte-Haddon Hall, Atlantic City, October 29-31.

National Pest Control Association, annual meeting, Statler Hotel, Boston, October 29-31.

Federation of Paint & Varnish Production Clubs, annual meeting, Chalfonte-Haddon Hall, Atlantic City, November 1-3.

American Petroleum Institute, annual meeting, Chicago, November 5-8.

23rd Exposition of Chemical Industries, Grand Central Palace, New York, November 26-December 1.

Chemical Specialties Manufacturers Association, annual meeting, Mayflower Hotel, Washington, D. C., December 2-4.

American Institute of Chemical Engineers, annual meeting, Chalfonte-Haddon Hall, Atlantic City, December 2-5.

Manufacturing Chemists' Association, semi-annual meeting, Waldorf-Astoria Hotel, New York, December 13.

Can Oxygen Speed Up Output Of Bessemer Steel?

The answer is yes—if the oxygen is used properly and in small amounts with the purifying air blast in Bessemer converters. This has now been proved in recent large-scale runs at the National works of National Tube Co. at McKeesport, Pa.

What's most important, the answer indicates that the use of oxygen in Bessemers may now have a better-than-even chance of becoming standard practice among U. S. steelmakers.

▶ Best results come from using only a little more than one percent of 99.5 percent oxygen in the air blast. Thus cost to the steelmaker is small. But the total tonnage of oxygen so consumed might become appreciable, since 10 percent of the nation's steel is made in Bessemers.

▶ Oxygen gives a speed-up of 1–2 min. for each 30-ton "blow." Translated into practical terms, this means that each Bessemer converter can turn out a bonus of 60 tons of steel during each 8-hr. day.

▶ Since at least five tons of scrap—two more than in normal practice—can now be used, oxygen cuts down the amount of pig iron that has to be charged to the converters. This means a cut in the tonnage of iron ore, limestone and coke needed by blast furnaces to make pig iron to feed the Bessemers.

▶ Oxygen—when properly used—does not have an adverse effect on the converter bottoms and lining life; it probably gives some improvement.

Actual amount of oxygen used at National was 4,000-6,000 cu. ft. for each 30-ton blow. The most effective feed rate was 1,000 cu. ft. per min. The best time for adding oxygen was during the first 4 min. of that portion of the blow designed to remove carbon from the charge.

Close to 3,000 oxygenated blows were made in National's research program.

Bureau of Mines Gasifies Pulverized Soft Coal

Bureau of Mines has successfully tested a new process for gasifying coal. It has great significance for the future of a synthetic liquid fuels industry.

First step in making synthetic gasoline and oil from coal is to gasify the coal. In one of the principal methods for converting coal to oil, the biggest problem is producing the gas in quantity and at a reasonable cost.

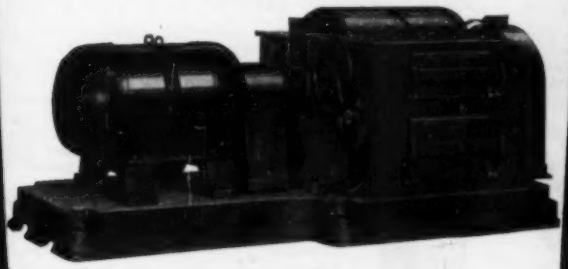
The new process does both. It gives a reasonably priced synthesis gas, and it has the very high capacity that

(Continued)

More "CRUSHING" FACTS ON American CRUSHER PERFORMANCE

No. 1 of a Series.
Taken from an Independent Survey.

18-YEAR-OLD American AC-1 STILL REDUCING 41,000 TONS OF FLINT CLAY YEARLY!



Only 2 Sets of Crusher Ring Replacements Since Original Installation!

Reducing tough 12" lumps of flint clay to a ½" minus product at an average yearly volume of 41,267 tons, is a proud record for any crusher. And for a crusher that has already passed its 18th birthday, this is significant testimony for American built-to-last performance and rugged durability.

Over 500,000 Tons Reduced Since 1933

The records show that over 500,000 tons of flint clay have been reduced by this AC-1 since 1933—with only 2 sets of ring replacements. (And the first set wasn't needed until 12 years after original installation!)

Discover for yourself why Americans are repeating this same story of high-tonnage-low maintenance wherever they are installed.

WRITE for Complete Literature.

American PULVERIZER COMPANY

1219 MACKLIND AVENUE • ST. LOUIS 10, MISSOURI

ASK ANY QUALIFIED AND IMPARTIAL AUTHORITY. . . HE'LL TELL YOU . . .

YOUR *BEST* PROTECTION

FOR FLAMMABLE LIQUID, GAS AND ELECTRICAL FIRES

ANSUL

DRY CHEMICAL

FIRE EXTINGUISHING EQUIPMENT

You, who have seen or used an Ansul Dry Chemical Extinguisher at a fire demonstration or on an actual fire, quickly recognized its superior fire-fighting capabilities. Further investigation proves that Ansul "Water-tight Construction" provides greater dependability under severe exposure conditions.

Ansul Hand Portable Models — 4, 4-B, 20-B and 30-B.

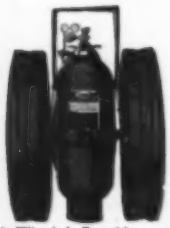
Fire Chiefs, insurance inspectors, safety engineers, etc. recognize Ansul as the leader in the dry chemical extinguisher field. Ansul Fire Extinguishing Equipment and *"PLUS-FIFTY"* Dry Chemical have set unparalleled standards of quality for the fire extinguisher industry.

You get *complete* dry chemical fire protection only from Ansul. There is an Ansul Dry Chemical Fire Extinguisher of the proper size for almost every flammable liquid, gas and electrical fire hazard.

Safeguard your plant and irreplaceable equipment with the *BEST* fire extinguishing equipment available. Protect them with ANSUL EXTINGUISHERS.

ANSUL EXCLUSIVE FEATURES

- Patented Nozzle assures most effective stream pattern . . . Best results by inexperienced operators.
- Special packings in Nozzle and other parts exclude water.
- Corrosion resistant construction throughout.
- Easy on-the-spot Recharging (No tools needed).
- Quick, *positive* puncture operation.
- Special guard protects cartridge . . . rugged construction throughout.
- Ansul *"PLUS-FIFTY"*® Dry Chemical used exclusively.
- Field tested by thousands of satisfied customers.
- Ansul LT Models are the only dry chemical extinguishers listed by U.L. for operation at −65° F.



Ansul Wheeled Portable Models — 150-A and 350-A.

Ansul Mobile Units—Mine Cars, Trailers, Jeep Equipped and Fire Trucks.

Ansul Piped Systems and Stationary Units.

Send for File No. 734. You will receive a variety of helpful printed matter. Included is our latest catalog which describes Ansul Extinguishers of all sizes — from the small Ansul Model 4 to Ansul Piped Systems and Ansul 2000 lb. Stationary Units.

ANSUL CHEMICAL COMPANY

Fire Extinguisher Division

MARINETTE • WISCONSIN

DISTRIBUTORS IN ALL PRINCIPAL CITIES IN THE U. S. A., CANADA AND OTHER COUNTRIES

would be needed for converting coal to gasoline and oil on a commercial scale.

The bureau's new process consists of feeding pulverized bituminous coal into a retort at high temperatures with oxygen and superheated steam. This produces a gas suitable for making all kinds of liquid fuels and essential by-products.

Bureau of Mines officials believe the process points the way toward more efficient, economical production of gasoline from coal. And they believe it is essential to America's well-being that gasoline be produced from coal as quickly as possible, for coal offers the way to make secure the nation's oil supplies—supplies that now could be seriously diminished by war.

U. S. Coal Reserves Promise Synthetic Fuels, Chemicals

Vast reserves of coal, increasingly important as a source of raw materials for the chemical industry, are revealed in a new appraisal by the U. S. Geological Survey.

It shows the potentially recoverable coal reserves of the United States to be 1.2 trillion tons. Of this, about 50 percent is bituminous coal, 19 percent subbituminous, 30 percent lignite, and 1 percent anthracite.

About 30 percent of the 1.2 trillion tons can be classed currently as being in beds 28 in. or more thick under less than 2,000 ft. of overburden. These limits define coal of present economic interest. But improved mining methods, or other recovery means (such as burning underground), will increase the percentage of "economic" coal.

Improved hydrogenation and gas synthesis methods of converting coal to oil make coal reserves important, particularly in view of depletion of natural petroleum. There are vast potentialities in recovery of benzene, phenols and other chemicals as by-products of synthetic petroleum manufacture.

Not discussed in the report, but important to the nation and its industries are these facts:

Almost all coal reserves are privately owned. The coal is located within our borders. This means (1) no bureaucratic or socialistic control, and (2) an assured supply for peace or war free from dictates of foreign cartels.

Kraft pulp and paper products will be made at a new $21 million mill to be put up by National Container Corp. at Valdosta, Ga. Certificate of necessity has been issued.

(Continued)

Five More Vulcan ROTARY KILNS

To Help Produce an Essential Chemical Material

The recent installation of Vulcan Rotary Kilns shown above is only one of many now being applied successfully to the calcining, nodulizing, desulphurizing or dehydrating of various types of ores and other inorganic materials. Either an oxidizing or a reducing atmosphere can be applied to the materials being processed or, if desired, they can be kept entirely free from the products of combustion.

For more than half a century the Vulcan Iron Works has been a leader in the design and manufacture of Rotary Kilns, Coolers, Dryers, Retorts, etc. Throughout all of this long period we have maintained the highest standards of quality—the best evidence of which is found in our list of users; which includes most of the larger companies in the Rock Products, Chemical Processing and Metallurgical industries.

Correspondence is invited regarding any requirement for the calcining, cooling or drying of any inorganic material. Our experienced engineers welcome opportunities to make suggestions without charge or obligation.

THIS BOOKLET MAY SAVE YOU MANY HOURS OF PRECIOUS WORKING TIME

It tells how to keep kilns running when trouble occurs—either permanently or until replacement parts can be secured. Better still, it tells how to PREVENT TROUBLE through proper precautions during installation and by watching out for conditions which may cause trouble if not corrected in time. Free on request to any one who can use it to advantage. Ask for Bulletin No. 389.

Vulcan Iron Works

Established 1849

WILKES-BARRE, PA., U.S.A.

Cable Address "Vulworks Wilkes-Barre"

Other Vulcan Products include Briquetting Machinery, Electric Hoists, Mining Machinery, Open Hearth Steel Castings, Heavy Special Machinery and all types of Modern Industrial Locomotives Bulletins on request.

Bulletin 8210

General Purpose Control Valves

- ★ Full Port Area—Packless
- ★ For Air, Gas, Water, Brine, Freon, Methyl Chloride, Light Oil and other Liquids and Gases up to 212°F; Pressures up to 400 pounds
- ★ Several Auxiliary Variations
- ★ Several Sizes: ⅛ to 2½ inches

Our Bulletin 8210 Solenoid Valves are designed for those shut-off requirements where a simple, rugged, automatic control will serve. They close instantly when current to the coil is cut off. Full line pressure on top of the valve piston aided by a powerful spring assures tight closing. They reopen fully when the coil energy is restored.

Bulletin 8211 Valves are similar except that they have Explosion-Proof Solenoids approved by Underwriters' Inc., Class 1, Group D, Hazardous Location.

ASCO Solenoid VALVES

If you have any automatic control problems that fit into the above class, study fully the merits of Asco Bulletin 8210 and 8211 Solenoid Valves. Write us anyway, regardless of your problems, because we have many other types of solenoid valves.

When in need of Electromagnetic Controls, come to us.

Automatic Switch Co.

381 Lakeside Avenue Orange, New Jersey

CASH-ACME *Valves* **DEMANDED BY INDUSTRY** *Everywhere*

Type "E" Pressure Reducing and Regulating Valve

You'll find CASH-ACME Automatic Valves on the job in the giant meat industry. The sausage stuffer shown at right is just one application of many where a CASH-ACME Valve is giving dependable pressure control. If you have the problem of finding a lifetime valve that will turn in consistent performance year after year on the products you manufacture, write today. We can show you the installation that will do the job.

Write for case histories showing the successful application of CASH-ACME Automatic Valves in dozens of industries everywhere.

CASH ACME SILENT SENTINEL *Automatic Valves*

A. W. CASH VALVE MANUFACTURING CORP.
6614 E. Wabash Avenue
Decatur, Illinois

Biddle Company CA-2500

NEWS, *cont. . .*

Para-chloro-benzaldehyde will be made in a new commercial unit that Heyden Chemical Corp. is putting up at its Fords, N. J., plant. The chemical is used for dye intermediates and insecticides.

Plutonium is now being turned out by General Electric at Hanford at less than half its 1946 cost. One big reason: more than $300 million for process improvements and new facilities.

Houdry catalytic cracking unit—82nd of its kind in the world—will be installed at the El Paso refinery of Standard of Texas. Design capacity of the new unit: 11,000 bbl. per day of oil.

Sulphur will be recovered from petroleum sources by a new $500,000 plant to be built by Shell Oil of Canada near Calgary, in Alberta. Output of 10,000 tons annually will go to British Columbia pulp mills.

Output of chemical and tungsten products will be upped by Sylvania Electric Products, Inc., at Towanda, Pa. Additional facilities will cost about $1 million and will enable Sylvania to put out a new line of chemicals and metals for the electronics field.

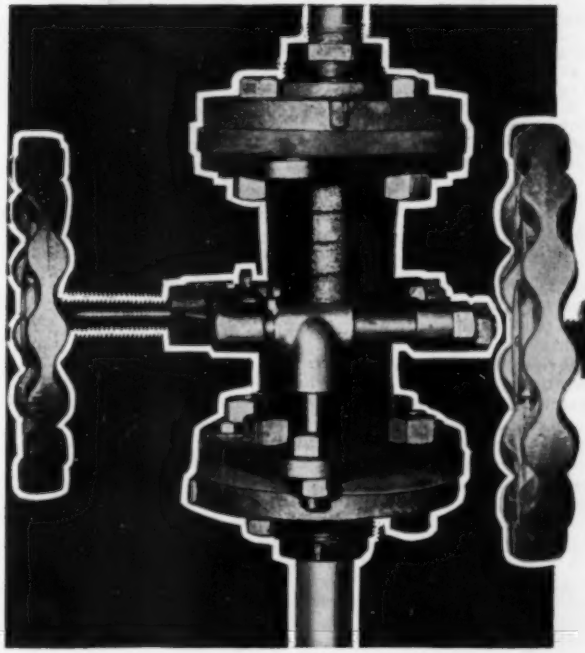
New electric furnaces will double calcium carbide output of Electro-Metallurgical Co.'s plant at Portland, Ore., built in 1942. The unit also makes ferro-alloys. Employment will go from 175 to over 350.

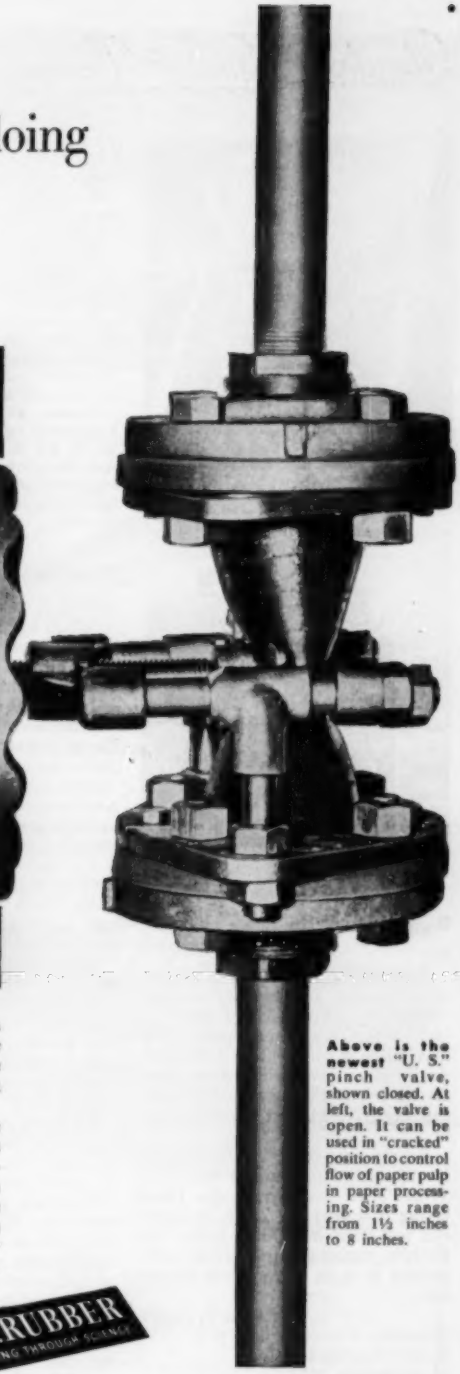
Antibiotics will be made at the 370-acre site recently bought by Eli Lilly & Co. near Lafayette, Ind. Construction work is now starting. Products and capacity "have not yet been determined."

World's largest synthetic rubber plant—the government-owned facilities at Institute, W. Va.—has been reactivated and is now operating slightly above its rated annual capacity of 90,000 long tons. The plant is operated by B. F. Goodrich Chemical Co. Goodrich also operates the 60,000-ton unit at Port Neches, Tex., now producing at 135 percent of rated capacity.

Carbon black: New $1.5 million Aromex carbon black plant of J. M. Huber Corp. is now operating. First unit is in production, and work has started on the second. Total plant capacity will be 36,000 tons annually. The plant is on a 300-acre site north of Baytown. —*End*

What's U. S. Rubber doing with pinch valves?





United States Rubber is squeezing out new production economies with its latest pinch valve. Designed for pipe lines carrying abrasive or corrosive mixtures, the valve eliminates "water hammer", breaks up galvanic action in pipe lines.

The valve reduces replacement costs because it can be refitted to new valve bodies. No packing or repacking is needed. Its design is very compact, with mechanism, retaining rings and pinch valve body in a single unit—an advantage where space is limited. The valve is available in neoprene for oil-resistance, or butyl rubber for high heat and severe acid conditions, or pure gum stock for food and beverage conveyance. Write to address below.

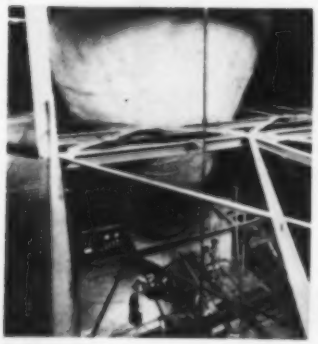
Above is the newest "U. S." pinch valve, shown closed. At left, the valve is open. It can be used in "cracked" position to control flow of paper pulp in paper processing. Sizes range from 1½ inches to 8 inches.

PRODUCT OF U.S.RUBBER SERVING THROUGH SCIENCE

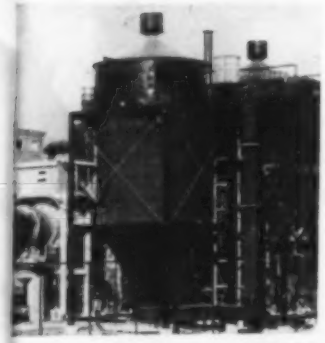
UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Readers' Views & Comments



BIG . . .



. . . BIGGER

Bigger Than Big

Sir:

Your news article in the June issue of *Chemical Engineering*, entitled "Spray Dryer Speeds up Process" is very interesting and constructive. We should like to point out, however, that this is not a new application of spray drying, nor is the Davison Chemical equipment "the largest of its kind ever built."

Bowen spray dryers were installed by American Cyanamid at their Fort Worth plant several years ago. These drying chambers are 26 ft. in diameter and stand over 70 ft. high. The Davison process and product are competitive to those of American Cyanamid.

RALPH T. REEVE
President
Bowen Engineering, Inc.
North Branch, N. J.

► *We did not intend to convey the impression that spray drying is new in catalyst manufacture—American Cyanamid has been using it for several years. The plant we described was Davison's new unit and the firm's first to use spray drying in the manufacture of microspheroidal catalyst.*

As for the relative sizes and capacities of Cyanamid's and Davison's catalyst spray dryers, here is the information now available to us:

Cyanamid: 70 ft. high, 26 ft. diameter. Evaporation capacity not available. In use at Fort Worth, Texas, for several years. Engineered and built by Bowen Engineering, Inc., North Branch, N. J.

Davison: 50 ft. high, 22 ft. diameter. Evaporation capacity over 30,000 lb. per hr. In use at Cincinnati for close to a year. Sometimes described as "The world's largest capacity spray dryer." Designed and built by Swenson Evaporator Co., Harvey, Ill.—ED.

Maintenance Cost Gap

Sir:

When I accepted your invitation to do an article on maintenance costs . . . I did not fully realize what I was letting myself in for.

I soon ran into several problems: (1) my cost data extended back over the past 14 years, so that some method had to be used to extrapolate all these figures into present-day costs; (2) there were quite a few pieces of process equipment on which I had very meager data.

For the extrapolation of costs, I used an engineering construction cost index which . . . reflects both labor and material costs in the chemical construction field.

To fill the gaps in my data, I made out a questionnaire and mailed it to 100 different chemical companies. . . . To my amazement, I learned that outside a handful of the leaders, most chemical companies do not maintain equipment maintenance cost records at all.

Of those replying, 65 percent said that maintenance costs were kept by processes, while 25 percent kept them by entire plants (10 percent said this information was confidential). But here's the thing that surprised me: 100 percent of the replies said that maintenance costs on individual pieces of equipment were unknown!

Many of those who answered indicated that they thought such records would be desirable—but doubted if the cost of setting up the records would justify the end results! I wish I could talk to those people for . . . I'm convinced that the end results would justify the costs by all means. Some day I hope to write you an article to demonstrate this point.

By the way, I made a little test of my data in the article I'm enclosing: I added up the maintenance costs of individual pieces of equipment for several different process units on which I had good total maintenance costs and found that there was good agreement between the "synthetic" and the "actual". So I believe my data will prove to be useful to others.

JACKSON D. LEONARD
Consulting Chemical Engineer
Metuchen, N. J.

► *We received this interesting letter with Jackson Leonard's article that you'll find on p. 149. We believe this article represents a pioneering effort in a field that needs further exploring. The author and the editors solicit your comments and additional data on process equipment maintenance costs.*—ED.

Perry on Motors

Sir:

I have greatly enjoyed reading the report "Motors and Motor Control" in the July issue of *Chemical Engineering* . . . an outstanding contribution to our chemical engineering literature on a subject that has not previously been so well crystallized in magazines that the chemical engineer reads or has readily available. The article could profitably have been expanded in many of its subjects to increase still further its usefulness if Mr. Kropf's time and your available space had permitted.

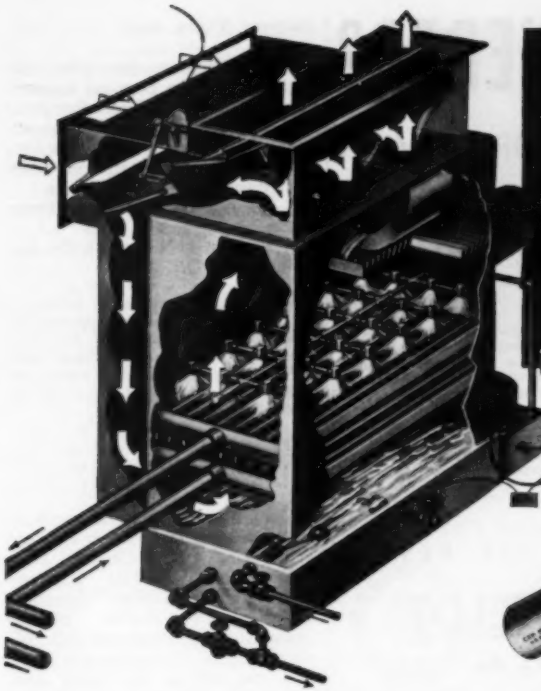
This report would make an excellent text for a university course in "Electrical Engineering Equipment for the Chemical Engineer" if other pertinent material were added. I hope that many professors of chemical engineering will see that it or something close to it is used in their own curricula.

I am interested in the possibilities of much the same treatment of this subject for use in the "Chemical Engineers' Handbook." A much more extensive treatment of cost data and cost estimating for electrical equipment (as well as all unit operation and unit process equipment) is being prepared now for use in the new handbook of business that is under way, as you know.

I hope that *Chemical Engineering*

(*Continued*)

Precise temperature control by Niagara Aero Heat Exchangers achieved by Multi-Purpose Thermostat



Fenwal THERMOSWITCH thermostat controls spray water temperature by admitting steam to steam injector — or turning on electric immersion heater to heat spray water.

These exchangers are particularly useful in chemical processes or in cooling quench baths during heat-treating of metals because their constant temperature assures uniform rate and quality in production.

One of the key points in the operation of Niagara Aero Heat Exchangers is precise temperature control of spray water.

To make sure of positive temperature control at all times, Niagara relies on a Fenwal THERMOSWITCH thermostat. This unique, low-cost unit prevents temperature of spray water from dropping below a given point by controlling steam injector or electric immersion heater which supplies additional heat. It also starts the spray pump motor.

These easy-to-install, easy-to-maintain Fenwal THERMOSWITCH thermostats are used to solve all types of control problems. Their activating control element is the single-metal shell that expands or contracts *instantaneously* with temperature changes, making or breaking the totally enclosed electrical contacts.

Find out now how Fenwal THERMOSWITCH units can help you. They effectively control many variables where heat is a factor. Mail coupon below for further information.

Fenwal

THERMOSWITCH

The Precision, Multi-Purpose, Thermostatic Control

SENSITIVE . . . but only to heat

FREE! **Get this bulletin . . . see what Fenwal THERMOSWITCH Units can do for you.**

Just fill in coupon and mail . . . no obligation.

FENWAL, INCORPORATED, 169 Pleasant St., Ashland, Mass.
111 South Burlington Ave., Los Angeles 4, Cal.
TEMPERATURE CONTROL ENGINEERS

Name ..... Position .....

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City ..... Zone ..... State .....

I am chiefly interested in the applications checked:

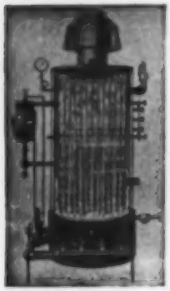
- ☐ Heating
- ☐ Cooling
- ☐ Humidity Control or Detection
- ☐ Alarm (over-temperature, under-temperature)
- ☐ Vapor Control
- ☐ Timing (thermal)
- ☐ Radiant Heat Control
- ☐ Pressure Control (by controlling vapor temperature)

OTHER (Please fill in your special requirements) .....

.....

.....

WHY BE BOTHERED?



THE KANE Boiler is built to A.S.M.E. specifications, in sizes to 30 H.P. The M-K-O Automatic Boiler Feed returns condensate and supplies small quantities of hot water as needed to the KANE Boiler.

NO FUSS, NO WORRY WITH the KANE BOILER PACKAGE

Here's a truly "unitized" steam supply — a compact, self-contained BOILER PACKAGE that is completely automatic . . . requires no attendant and only a bare minimum of floor space. The KANE BOILER PACKAGE includes: the correctly sized Automatic Gas-Fired Boiler complete with gas burner and controls to maintain required steam pressure; and an M-K-O Automatic Boiler Feed system designed to return condensate and supply make-up water as required for highest operating efficiency.

Engineered Steam at its best with four decades of experience at your disposal—so, send your steam problem to us for study and recommendation.

ENGINEERED STEAM AT ITS BEST

MEARS-KANE-OFELDT INC.

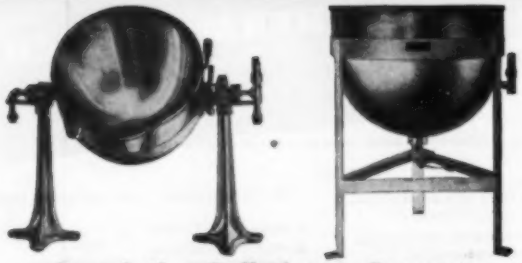
P.O. BOX 223 BRIDGEPORT, PA.

FOUR DECADES OF AUTOMATIC GAS-FIRED BOILER MANUFACTURING EXPERIENCE

FOR EVERY PROCESSING NEED

LEE Kettles

WHERE CORROSION-RESISTANT EQUIPMENT IS NEEDED



Descriptive Bulletins on Request

LEE METAL PRODUCTS CO. INC.

417 PINE STREET . . . PHILIPSBURG, PA.

ALL LEE KETTLES ARE MADE TO A.S.M.E. CODE

publishes similar reports in other fields of interest to the chemical engineer. Among the many subjects that could properly be treated are: instruments, valves, illumination, safety devices, heat transfer equipment, combustion and power generation auxiliaries.

JOHN H. PERRY
Chemical Engineer
E. I. du Pont de Nemours & Co., Inc.
Wilmington, Del.

▶ *We appreciate Jack Perry's interest in our Motors report and his suggestions on other subjects that we could treat in a similar way. We've already been thinking about one or two of these topics—but what about your vote for the one we should tackle first?*—ED.

TVA Corrections

Sir:

Our article on the production of calcium metaphosphate which appeared in the June issue of *Chemical Engineering* under the title "Improved Fertilizer Plant Design" apparently underwent considerable editorial change at the hands of your staff. We were not given an opportunity to review the changes that were made before the article was published, and we find that some of these changes are particularly embarrassing to us. For example, the opening sentence which appears immediately under our names reads as follows: "In 1937 TVA engineers were proud, etc.," and on p. 135, middle column, it is stated "The plant has two main features that do its engineers credit." Though we are flattered by these statements, which obviously reflect your personal opinions, we believe that it would have been more appropriate for you to have presented them as editor's comments. They are very unbecoming when made to appear as coming from us.

Other changes in our article resulted in misleading statements and inaccuracies. These are listed below, along with some clarifying comments.

1. The subheading of the article contains the following statement "Burns liquid phosphorus more efficiently." This is very doubtful. We know of no basis for this, and we made no such claim.

2. Increased capacity is emphasized in the subheading and on the first page of the article. This is misleading. It is true that the capacity of the new plant is greater than that of the old one, but it is also true that the new plant is larger than the old plant.

3. The choice of the word "catalyzed" which appears in the second column on p. 135 is unfortunate. There was no evidence that P_2O_5 re-

acted more rapidly with fine particles of rock phosphate than with large particles of this material. Even if the reaction had been more rapid because of smaller particle size, the term "catalyzed" would not be correct.

4. An inaccuracy of minor importance is present in the text in the third column on p. 136. The reader is informed that the old metaphosphate cooler was internally water-cooled. Actually, it was externally water-cooled.

5. On p. 136, second column, last sentence, second paragraph, "conveyed by screen" has been substituted for "conveyed by a screw."

L. D. YATES
L. F. ROY
R. S. MELINE
Chemical Engineers
Division of Chemical Engineering
Tennessee Valley Authority
Wilson Dam, Ala.

► *A sharp and sobering lesson in caution for an over-enthusiastic editor.*—ED.

How Much for Engineering?

Sir:

I have finished reading your June article on the subject of cost estimation. This article, and those of others on cost estimation in the chemical equipment and construction fields, have been quite helpful.

Yet there is one phase of cost estimation which I have not been able to find any good published information on, and yet it is a sizeable portion of the whole job:

Given a plant to design, how much time and money should be set aside by an engineering department for engineering, design and drafting, and procurement?

Let us assume that the total job, including excavation, building, equipment installation, etc., costs about $2 million. How much of this would be allocated to an outside engineering firm (or the company's engineering department) for (1) engineering, (2) design and drafting, (3) procurement, and (4) field supervision?

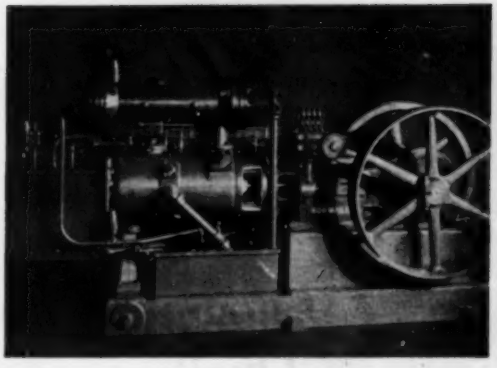
I feel that if I had this information for any one chemical plant, extrapolation for another size or type of plant would be relatively easy. I have searched for it, but so far have been unable to find it.

If you know of any published information, would you please let me know?

JOHN J. MAHONEY
Chemical Engineer
J. P. O'Donnell Associates
New York, N. Y.

► *In our article by C. H. Chilton in June,*

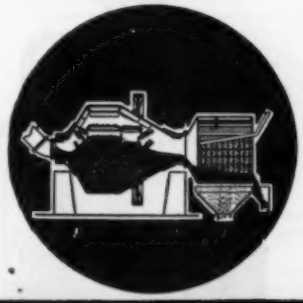
(Continued)



4 Stage Norwalk tandem compressor on steel base, for handling air, oxygen, hydrogen, helium, ethylene, natural gas or mixtures. For details write for complete catalog.

NORWALK COMPANY, INC.
SOUTH NORWALK CONNECTICUT
Established 1864

WHY . . .
MASS ACTION
in mineral scrubbing?



"Mass Action" in a HARDINGE CONICAL SCRUBBER is similar to the effect obtained by rubbing a handful of pebbles between the palms in a stream of water.

This scrubber is capable of removing a very hard clay from ores, phosphate rock, gravel, etc., in a very short time with only nominal wear in the machine itself.

Write for Bulletin 37-A-11 and give us pertinent details of your scrubbing problem.

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Pharmaceuticals that are filtered in . . .

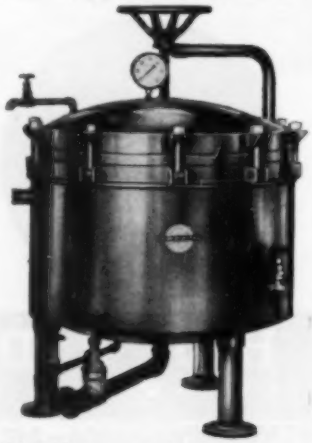
SPARKLER FILTERS

Each company whose trade-mark is shown above has, for many years, produced medicinals meeting the highest attainable standards. As a result, their reputations are based on what amounts to a public trust that products bearing these trade-marks can be used with complete confidence. To protect their positions of leadership, these manufacturers employ every conceivable safeguard to assure unvarying purity.

We are proud, therefore, that Sparkler filters have been chosen by such outstanding companies, and that we have been associated with them for so long — because we earnestly believe that Sparkler filters have contributed to their success.

Sparkler design and construction lend themselves perfectly to sanitation and superior filtration because Sparkler originated and perfected the horizontal plate principle; the scavenger plate to assure complete recovery of product; the use of cartridge-type elements that minimize down-time and simplify cleaning; the flexibility that permits use of all types of media; and many other distinctive advantages.

If quality and efficiency at economical operating costs are *your* foremost considerations, you will want to know more about Sparkler filters. Write for your copy of the Sparkler catalog today. For engineering assistance, write Mr. Eric Anderson.



Representatives in all principal cities

SPARKLER MANUFACTURING COMPANY Mundelein, Illinois

Manufacturers of fine filtration equipment for more than a quarter of a century

1949 (p. 97-106), we recommended the use of percentage factors for the costs of engineering and construction. For jobs involving straight-forward engineering and average labor-to-materials ratio, this factor was 20 to 35 percent of the total physical cost of equipment, piping, buildings, etc. For a job involving complex engineering and a high labor-to-materials ratio, it was 35 to 50 percent.

This includes not only the engineering costs, but also those costs which might be considered as construction overhead—insurance, rental of tools, temporary construction and field supervision. Eliminating these, the costs of engineering design, drafting, etc. should run from 10 to 20 percent (in the low part of the range for straight-forward engineering and in the upper part for complex engineering).

*In an article by Happel, Aries & Borns, which appeared in our December 1946 issue (p. 97-100), several of these cost factors were given. Indirect construction expense was said to be 40-60 percent of the direct labor cost. This term included such items as temporary construction, rental of equipment, field and home office overhead, engineering design and drafting, insurance, etc. Where the job is done by an outside contractor, the contractor's fee was said to run between 7-15 percent of the direct labor and materials cost.—*ED.

Wanted: Data on Auxiliaries

Sir:

In our work here . . . we have very frequent occasion to make use of cost data published by *Chemical Engineering*. In particular, we use Chilton's admirable summary of costs and estimated procedures published in June, 1949.

One point is not clear to us. Since we use your data and methods so constantly, it would be appreciated very much if you would do us the favor of elaborating on the "auxiliaries" item used in the overall multiplying factors. We have had considerable argument as to what it should include. Is it intended, for example, to include steam generators and cooling towers?

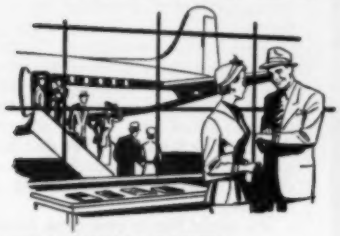
R. M. PRITCHETT
Chemical Engineer
Celanese Corp. of America
Clarkwood, Texas

▶ *The "auxiliary facilities" factor is intended to include everything not specifically figured elsewhere—and that's why it varies from 0-100 percent. It usually includes steam generation, roads and walkways, major distribution of utilities, water treatment, office and laboratory buildings, maintenance and repair shops and other facilities permanently shared with processing units.*

*Wanted by CE editors and a lot of CE readers: one fact-studded, down-to-earth article on cost factors for process plant auxiliary facilities.—*ED. *(Continued)*

American Blower...a time-honored name in air handling

Birmingham, Ala., has a conveniently located American Blower Branch Office to provide you with data and equipment for air handling. You can reach American Blower in Birmingham by calling 7-2383. In other cities, consult your phone book.



TEMPERATURES TAMED...

Passengers and employees alike appreciate the pleasant atmosphere created by American Blower Air Conditioning Units in a large southern air terminal. These units circulate cool, conditioned air and maintain comfortable temperatures the year round. American Blower Air Conditioning Units are widely used in commerce and industry to cool and dehumidify in summer, heat and humidify in winter. Users find this dual function by the same unit saves them money. May American Blower help you?

BAKER'S DELIGHT...

A large midwest bakery recently installed several smartly styled American Blower Ventura Fans in its new, modern plant. Result—cleaner, pleasanter working conditions, improved employee efficiency. Ventura Fans maintain air circulation by exhausting hot, stale air quickly and efficiently. They are ideal for ventilating shops, factories, offices, and in many other applications. All carry Certified Ratings and are sound-rated for quiet operation. Good ventilation is good business in your plants, too.

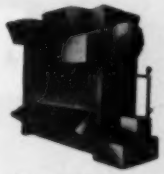
HOW IS THE TIME...

Plan now for winter heating. If your present heating system is inadequate or inefficient, replace or supplement it with American Blower Unit Heaters. These efficient Unit Heaters distribute heat evenly over a wide area, assure comfortable final temperatures everywhere. In many installations, American Blower Unit Heaters have paid for themselves in fuel savings alone within two to three years! Models for steam or hot water heating systems, also self-contained, gas-fired models.

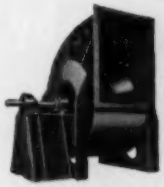
Whether your needs are civilian or military, American Blower heating, cooling, drying, air conditioning and air handling equipment contributes toward improving over-all comfort and efficiency. For data, phone or write our nearest branch office.

Unit Heaters

Ventura Fans



Air Conditioning Equipment



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Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

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STAINLESS STEEL CASTINGS
. . . resist
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In many processing plants you'll see FAHRITE stainless steel castings withstanding the ravaging effects of powerful corrosive agents. From the variety of grades of FAHRITE our engineers will recommend the proper one for your specific operating conditions.
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DDT for Korea

Sir:

We are interested in the item "DDT Output" in the Foreign News department of *Chemical Engineering*, March 1951. We are pleased that you noticed Nippon Soda Co. is the largest of Japan's eight DDT manufacturers; and that we are cooperating with the U. N. Forces in Korea by supplying them with material. We will increase our production of DDT this year.

The *Chemical Engineering* picture flowsheet on DDT (Nov., 1950) was helpful to us. One point, the drying of condensed DDT, is especially interesting to us. According to the description and the flowsheet, the mixture of DDT and chlorobenzene is dropped into a steam-heated 500-gal. dryer where chlorobenzene is recovered and the DDT is dried. We find, however, from our experience that the mixture is not easy to dry without decomposing the DDT. We find that some other method of drying such as vacuum, agitating, or air blowing is necessary.

We would like to have more details on the drying process of the mixture of DDT, chlorobenzene and water released from the condensation unit.

We shall be very happy if you will help us in this matter, so that we may promote the production of our DDT in the present emergency.

KATSUMI OGA
Technical Director
Nippon Soda Co., Ltd.
Tokyo, Japan

► *Pennsalt engineers, who supplied information for our DDT flow-sheet, report that the operation is accomplished in a 500-gal., glass-lined, jacketed vessel with steam at 20 psi. in the jacket. Live steam is sparged into the vessel contents by means of a lead coil drilled with ¼ in. holes. No mechanical agitation is needed.*

It is obvious that this becomes, in effect, a steam distillation of monochlorobenzene. After removal of that material, a small quantity of steam is still maintained through the sparger to agitate the molten DDT with retention of the steam on the jacket. Inasmuch as the temperature level is about 225-250 deg. F., the residual water is removed to less than 0.1 percent. The entire operation in this size batch requires between 5 and 6 hr.

It is possible to use vacuum, but with little resulting benefit, and with the disadvantage normally associated with vacuum work.

The most critical factor is the absolute absence of iron. At the temperatures involved, iron will cause ready decomposition of the DDT and the evolution of large quantities of hydrogen chloride.—ED.

—*End*

CUTS COSTS

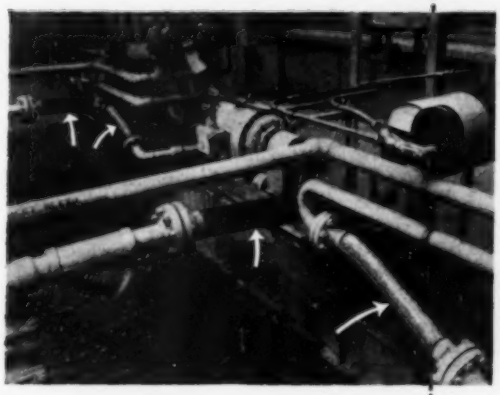
There are two ways to make more money: cut your costs—increase your sales. American Flexible Metal Hose and Seamless Flexible Metal Tubing have cut many manufacturers' product costs by simplifying assembly; have made many products more useful and more salable.

SELLS PRODUCTS

Investigate these versatile, strong, tight, flexible connectors for *your* product—for connecting piping or ports that move, vibrate or are out of alignment. There's a type for conveying liquids, gases, semisolids, chemicals and oils under severe conditions of temperature, pressure, corrosion and stress. Write now for Bulletins SS-50 and CC-300. The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Company, Ltd.

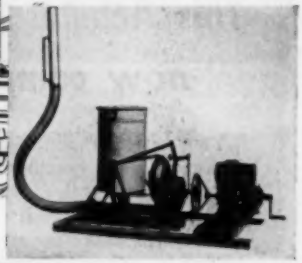
SPOUTS DEADLY DUST

American Lightweight Flexible Metal Hose directs the dust from this Simplex Orchard Duster of the Simplex Mfg. Co., McQueeney, Texas. Uniform flexibility for ease of handling, no complicated parts to break or get out of order and ease of detaching won the job for American Flexible Metal Hose.



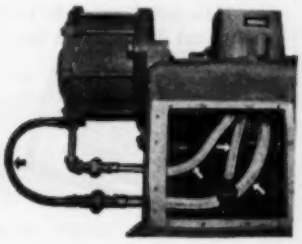
SOAKS UP SHOCKS

Four American Stainless Steel Flexible Tubing assemblies absorb shock from vaporization and hammer in suction and discharge of high-pressure pumps at Willow Island, W. Va., plant of American Cyanamid Co.



TIGHT SQUEEZE

American Seamless Flexible Bronze Tubing saves a lot of time and money in making the compressed air connections on this tube beading and flaring machine. Note flexible tubing's workability in confined spaces.



WHEREVER CONNECTORS MUST MOVE... American

ANACONDA

FLEXIBLE METAL HOSE AND TUBING

*Overcured Sections — unavoidable every 30′ to 40′ in all belts made by the flat press method. Only Rotocuring (continuous, non-stop curing) eliminates this major cause of belt failure.

OCS* means Trouble Ahead!

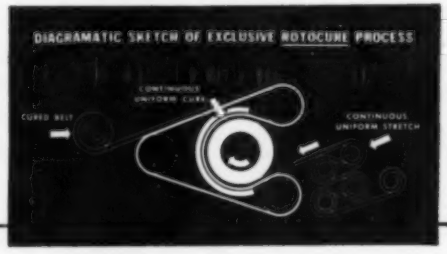
This Achilles Heel of Conventional Conveyor Belts now completely eliminated by ROTOCURE

Your neighborhood tailor with a hot pressing iron can give you a simple but dramatic example of what *too much* heat and pressure applied to a given area of cloth (or rubber compound) can do to these structures. In the manufacture of conveyor belting by conventional flat press curing the result is overcured segments 2" to 4" long across the belt width. These weakened portions of the belt are inherent in this process of "start and stop" vulcanization. They get a double treatment because earlier cured areas move forward *less than a full press length.*

Rotocure, the modern BWH method, eliminates these Achilles Heels of otherwise strong belting. Your Rotocure belt is *constantly* in uniform motion during vulcanization.

How does it pay off? In (1) elimination of mechanical distortion at the press ends, (2) up to 40% increased belt flex life, (3) constant, uniform stretch, (4) uniform, abrasion-resistant covers. Remember the major CURE for high belt maintenance costs and premature belt failure is NO OVERCURING! You'll cut the costs of whatever you convey. See your BWH distributor or write us direct.

P.S. Look into BWH rotocured transmission belts also. They permit operation at lower tensions. You get an *additional* bonus in extended belt life.



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ELECTRO-PLATERS COMPANY OF MILWAUKEE

relies on GAS

for Efficient, Economical Electro-Plating

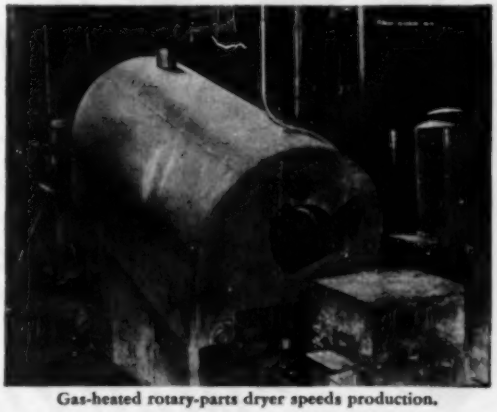
Important factors in the success of the production line technique of plated parts at Electro-Platers Co. are the GAS-fired immersion burners used to heat plating solutions to proper temperatures.

Such diverse items as hub caps, oven door handles, hardware, and dairy industry cylinders are plated in tanks containing Gas-heated solutions. Tanks are fired by Surface Combustion Corporation's 6″ atmosphere burners on immersion tubes. The bulk of the plating is Copper, Nickel, Chromium, Cadmium, and bright Zinc.

Gas immersion burners (at bottom of plating tanks) accurately maintain required plating solution temperatures at Electro-Platers Company, Milwaukee, Wisconsin.

ADVANTAGES OF GAS

- **Precise temperature controls maintain exact temperatures.**
- **GAS immersion burners require virtually no maintenance.**
- **GAS burner operation has proved itself economical.**



Gas-heated rotary-parts dryer speeds production.

Throughout Industry, the numerous applications of GAS demonstrate the versatility, economy, simplicity, and efficiency of GAS as an Industrial Fuel. Your local Gas Company Representative can give you the facts about GAS and the advantages of GAS in your production line. Call him today.

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know there's never a question about UNIFORMITY with Esso Petroleum Solvents. Exacting modern refining methods give Esso Solvents closely controlled uniformity for better processing.

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4. **Solvency** — Esso aliphatics and Solvesso aromatics cover both high and low solvency ranges.

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Esso Solvents: versatility and dependability with controlled high quality.

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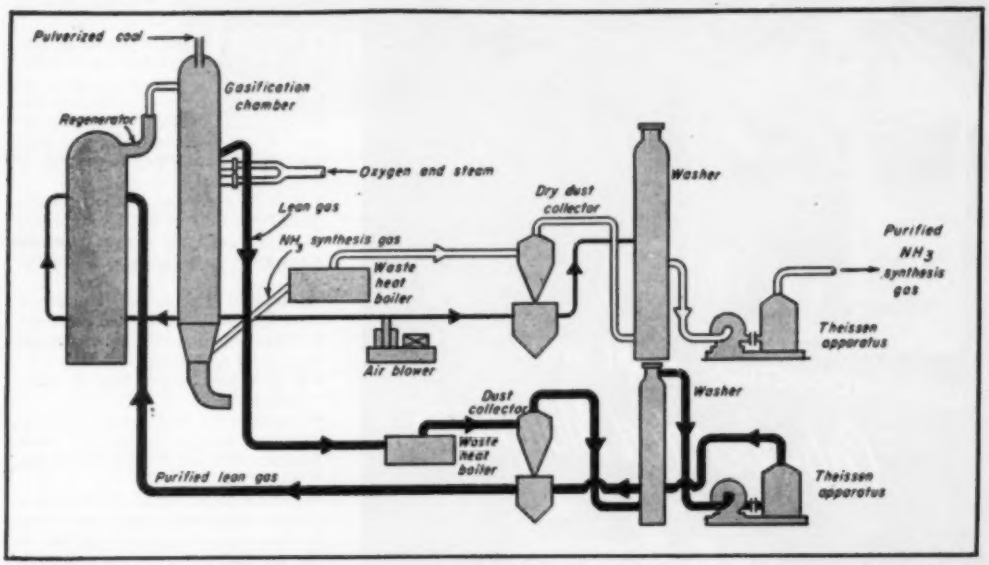
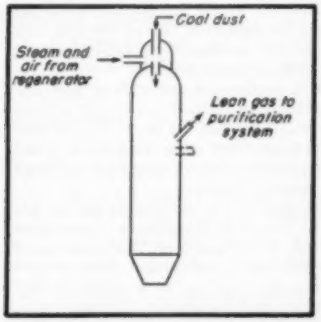
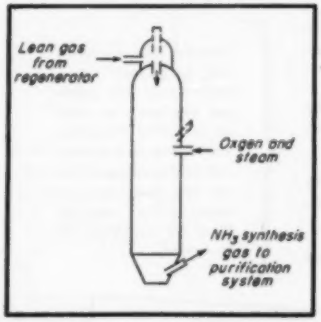


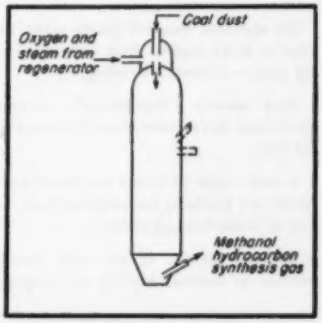
VERSATILE GASIFICATION CHAMBER in this three-system process can be hooked up in different ways, as shown below, to handle several syntheses. Remainder of the process: regeneration, purification.



LEAN GAS—coal dust plus preheated steam and air.



NH_3 SYNTHESIS GAS—lean gas plus oxygen and steam.



METHANOL SYNTHESIS GAS—coal dust plus preheated oxygen and steam.

Latest in Coal Gasification

French firm has developed a more economic method for gasification of many types of coals for the production of ammonia, methanol, or hydrocarbon synthesis gas.

Chemical process industries may shortly become more interested in new Panindco, Compagnie Pan-Europeenne d'Installations, process for making synthesis gas from coal. And there is reason why it should. The process, invented by a German engineer, already has global attention. Governments from Pakistan to Ireland are interested in the tests run at its demonstration plant in Grande Quevelly, near Rouen.

Just as far-reaching is the potential application of the process to a variety of fuels. It is adapted for the gasification of heavy refinery residues, peat, lignites, as well as the ordinary types of European coals. The application, however, of the Panindco process to U. S. fuels has not been studied as yet.

New Features: The process has many new features:

► It is of special interest for fuels that

(Continued)

1. Cab-operated monorail hoists serve single bays or entire plants — from yards or unloading areas — without rehandling.

2. They operate "thru-the-air" — conserving floor space. Never interfere with production on the floor.

3. A wide range of trolley travel and hoisting speeds are available for adapting these machines to production requirements.

4. Operator always in the most favorable position for accurate spotting and stacking.

Shepard Niles specialists will study your operations — show you where and how you can speed up material handling with cab-operated monorail hoist service, and how you can save time and money while doing it. Write for additional information.

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CRANE & HOIST CORPORATION

Makes and sells all three lifting tools for airborne shop loads

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cannot be gasified in ordinary gas producers. The process can handle fuels that are in the form of slack, or are disintegrating to dust when dried.

- It is a new means of producing NH_3 synthesis gas.
- It is a new means of producing synthesis gas for the production of methanol.
- It is a new means of producing synthesis gas for the Fischer-Tropsch process. It can use practically any reactive fines or middlings of coking or non-coking coals.
- It is an economic method for the production of lean gas for industrial use. Lean gas could replace industrial gases made from high priced coal and coke.

Advantages: The process has advantages over other gasification processes:

- Pulverized run-of-the-mine coal can be used for gasification.
- It uses less oxygen than all other known processes.
- The function of the regenerators is simplified because an air and steam mixture, and not a combustible gas, is preheated.
- The danger of explosion in the gasification chambers is excluded owing to the constant excess of carbon in the gas flow.
- The generators can be used indifferently for the production of lean gas, of synthesis NH_3 gas, of Fischer-Tropsch synthesis gas, or synthesis gas for methanol. It can produce lean gas and synthesis gas successively in the same equipment.
- It produces a gas with a very low content of CH_4; it can guarantee less than 1 percent. It thereby eliminates the necessity of a conversion plant that most modern ammonia synthesis processes require.

Designers: The gasification process was developed by Panindco in cooperation with H. Schmalfeldt, the inventor of coal dust gasification. The process was first applied to a synthetic fuel plant in Lutzkendorf, Germany, during the war. This plant was the first industrial coal gasification plant in the world.

K. Baum, an associate of Panindco and a well-known specialist in the gasification of coal, worked with the German engineer; and the two developed the process. The demonstration plant in Grande Quevelly was completed last July. It was built by Panindco together with the Compagnie General de Construction de Fours and the Charbonnages de France. Patent applications have been filed in the U. S. And the process has been licensed to concerns in France, England and Germany.

(Continued)

PRODUCT CONTROL THROUGH *INFRARED ANALYSIS*

Number 2 *of a Series of Data Sheets for Better Process Control from The Perkin-Elmer Corporation, Norwalk, Conn., Manufacturers of Infrared Spectrometers, Flame Photometers and Electro-optical Instruments.*

PROBLEM:

Rapid, accurate determination of small amounts of water in Freon refrigerants.

PLANT:

E. I. du Pont de Nemours & Co., Deepwater, N.J., & E. Chicago, Ind.

SOLUTION:

Infrared Analysis. Sample compressed in 4-inch pressure gas cell. Infrared analysis carried out at 2.67-micron band (water vapor absorption region). Measured optical density converted to water concentration in parts per million by graph, Fig. 1.

INSTRUMENTATION:

Commercial infrared spectrometer, rock salt optics, 4-inch pressure gas cell.

DISCUSSION:

Moisture in refrigerants may plug expansion valves or capillary tubes by ice, corrode metal parts, copper plate bearings or (other) rubber surfaces. Critical level for water concentration is 10 p.p.m.

Classical Analytical Procedure – Phosphorous pentoxide method – accurate to only 2 p.p.m., 4 hours per determination.

Infrared Spectrometer Analysis – accurate to 1 p.p.m. in 0–10 p.p.m. range, 5 minutes per determination.

REFERENCE:

(1) Anal. Chem., 19, 11, 1947 (procedure)
(2) Instrument News 2, 1, 5 (instrumentation)

CONCLUSIONS:

Method may be applied to other liquids and gases.

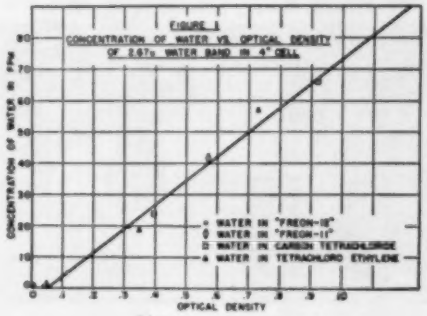


FIGURE 1
CONCENTRATION OF WATER VS. OPTICAL DENSITY OF 2.67μ WATER BAND IN 4" CELL
CONCENTRATION OF WATER IN P.P.M.
OPTICAL DENSITY
WATER IN "FREON-12"
WATER IN "FREON-11"
WATER IN CARBON TETRACHLORIDE
WATER IN TETRACHLORO ETHYLENE

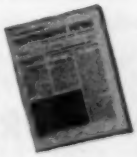
Infrared Spectra of Water in Carbon Tetrachloride. Shows 2.67-micron water band.

Figures from Reference (1).

Let us discuss your Product Control Problems with you.

THE PERKIN-ELMER CORPORATION

NORWALK, CONN.



ARE YOU RECEIVING INSTRUMENT NEWS?

This 8-page quarterly brings you the latest developments in electro-optical instrumentation as well as their application to research and process control.

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Get the most out of your Spraying Equipment with minimum power . . . with efficient spraying.

Use Yarway Nozzles. No internal vanes or other restrictions to clog or hinder flow. Two types—Yarway Involute-type producing a fine hollow spray with minimum energy loss, and Yarway Fan-type producing a flat fan-shaped spray with time-saving slicing action for cleaning.

Wide range of standard sizes and capacities. Cast or machined from solid bar stock.

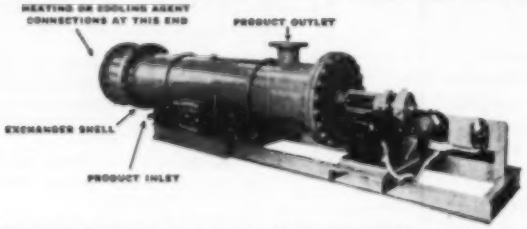
Thousands in use. Write for Bulletin N-616.

YARWAY SPRAY NOZZLES

YARNALL-WARING COMPANY
137 Mermaid Avenue, Philadelphia 18, Pa.

DO YOUR PROCESS HEAT EXCHANGERS FOUL UP?

. . . THEN USE THE Paracoil
AUTOMATIC SELF CLEANING HEAT EXCHANGER



Specifically designed for those heat transfer processes involving the continuous heating or cooling of viscous materials or fluids that normally deposit heat insulating films on exchanger tubes or autoclave surfaces.

With the Paracoil Self Cleaning Heat Exchanger all product deposits are automatically removed from exchanger tubes by motor driven Scraper Surfaces moving continuously or at intervals determined by needs of the specific process.

OBTAIN . . .

• Maximum Production — No plant shutdown for cleaning!
• Maximum Heat Transfer — Tube Surfaces are always clean!
• A Better, More Uniform Product — Conditions at their best!

Particularly adapted to the handling of vegetable oils, fats, waxes, pastes, creams. Write for Bulletin HE-100. We invite your inquiries.

DAVIS ENGINEERING CORPORATION
1064 EAST GRAND STREET, ELIZABETH, N. J.

Types of Feed Coals: The Panindco plant has run tests on various kinds of French coals, as well as foreign coals and lignites. Comprehensive tests have been made on Ptolomeis lignite from Greece, under ECA directives, for the purpose of making NH_3 synthesis gas. This work has been supervised by L. L. Newman, chief gasification engineer of the U. S. Bureau of Mines. A series of tests also have been made on coking coal fines from the Ruhr.

Other Types of Fuels: Heavy refinery residues are adaptable to the process. Residues such as Bunker C fuel oil were tested in August for the purpose of making NH_3 synthesis gas. Upon completion of these tests, Panindco will run tests on 240 tons of coal from Pakistan for the Pakistan government.

In the near future tests will be made on peat. If they are as successful as the Greek lignite tests, the Panindco process will become of great interest to such countries as Ireland, Denmark, Israel, Finland and others where no coal is available, but where peat can be mined economically.

Application in the U. S.: The Panindco process could be utilized in the U. S. But problems of fuels, their availability and price, must be studied first. New refinery processes here, such as catalytic cracking, tend to give heavy refinery residues. It is possible, therefore, to gasify such residues to produce economically either synthesis gas or lean gas.

Lean Gas Process: Regenerators preheat a mixture of air and steam. The mixture enters the gasification chamber at a temperature from 1,000 to 1,500 deg. C. The pulverized coal enters the upper part of the gasification chamber. Lean gas is formed. It is sent to the lower chamber. One part of the lean gas is taken off. This part is cooled in a waste heat boiler. It then enters a dry dust collector. And then it is washed and cooled by a washing apparatus. After being taken in by a ventilator, the gas is finally washed in a Theissen apparatus. The purified gas is then driven back towards the regenerator where it preheats the mixture of air and steam.

NH_3 Synthesis Gas Process: The other part of the hot lean gas remains in the lower chamber. Oxygen and steam are introduced; this produces further gasification.

Treatment of the hot synthesis gas is the same as that of the taken-off lean gas. The hot gas is cooled as it passes through a waste-heat boiler. It then passes through a dry dust collector. Then it is washed in a tower. The gas is aspirated by the ventilator. And then it is driven back through

a Theissen washer where it is purified completely. This gas is now ready for ammonia synthesis.

Air Flow: The air for feeding comes from a ventilator. Its current is divided into two parts. One goes through a moistening device fed by hot water coming from the washer. The other part unites with the lean current, is mixed, and introduced into the regenerators. It is also possible to send the air of the gasification chamber directly to the generator after a preliminary addition of steam.

Reported This Month

CANADA

Sulphur from iron pyrites for the pulp and paper industry is now being tried out on a large scale in British Columbia by the Columbia Cellulose Co. Ltd. at its Port Edwards plant near Prince Rupert. The pyrites, which form a huge slag pile at the Britannia Mining & Smelting Co. Ltd. operation on Howe Sound, are about 50 percent sulphur. Britannia, which operates one of the British Commonwealth's major copper mines, has a pile of about 100,000 tons of pyrites and is adding to it at the rate of about 200 tons a day. Previously the pyrites had been shipped to Japan and France, but these shipments probably will be reduced if local demand is large enough.

Other B. C. pulp and paper companies have reached an agreement with Alberta natural gas producers to obtain sulphur from prairie wells.

A $10 million refinery will be completed by Sun Oil Co. at Sarnia, Ont., by March 1953. It will be able to process 10,000 to 15,000 bbl. daily of crude oil. The plant includes a combination atmospheric and vacuu mdistillation unit as well as an 8,000 bbl. a day catalytic cracking unit. Products will be: high quality gasoline, kerosene, domestic and vacuum distillation unit as well heating oil, residual or heavy burning oil, and light hydrocarbons for use by the synthetic rubber plant in Sarnia of the Polymer Corp.

Britain may turn toward Alberta tar sands for possible development of oil resources in Canada to offset oil losses in Iran, according to reports coming out of Ottawa. Investment by British interests in such an undertaking would involve negotiations with the Government of Alberta in the provincial field rather than the Canadian Government in the federal field. *(Continued)*

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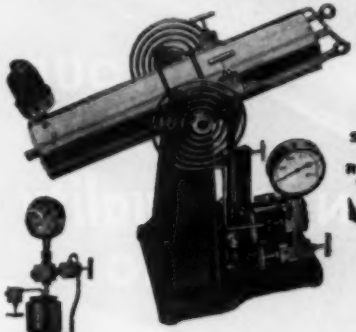

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Carbon black plant, to cost $1 million, will be constructed in Sarnia, Ont., for Godfrey L. Cabot Inc., of Boston. Stone & Webster Canada Ltd. has just begun work on the project.

Columbia Cellulose Co.'s new $27 million high alpha pulp mill at Port Edward, B. C., might be diverted to production of strategic war materials in an emergency according to general manager Ralph Ball. The Celanese subsidiary's new plant is now producing 120 tons of acetate dissolving pulp daily and is being stepped up to 200 tons capacity.

A masterpiece of pushbutton machinery, it could be switched with only a few minor production line adjustments to output of nitrate pulp for smokeless powders, rocket propellants and other defense materials. Indicative of the remote control setup in the chemical bleaching and washing section of the plant, where three men on the top floor control all operations on the eight floors of the building through a three-section control panel. Wood chips are transported by conveyors in another building by remote control operation. Only 300 persons, including office staff, are employed at the plant.

A $2 million plywood manufacturing operation of British Columbia Forest Products Ltd. will be built at Victoria. It will be integrated with the company's sawmill there and will have a rated capacity of 40,000,000 sq. ft. of plywood (basis ⅜ in. thickness).

Construction is to start immediately with production planned in 12 months. Output will equal one-seventh of the output of the seven other mills of five plywood manufacturers in British Columbia, totaling 290,000,000 sq. ft. in 1950.

AUSTRALIA

Polyvinyl chloride production will be increased to 6,000 tons within the next three years by Imperial Chemical Industries of Australia and New Zealand, Ltd. By 1954 imports of this chemical may be dispensed with.

The same company proposes also to expand in a serious way its chlorine and caustic soda industry so as to be able to supply the great new Courtauld's rayon plant at Tomago, New South Wales.

Large pyrites deposits at Nairne,

(*Continued*)

the door is still open

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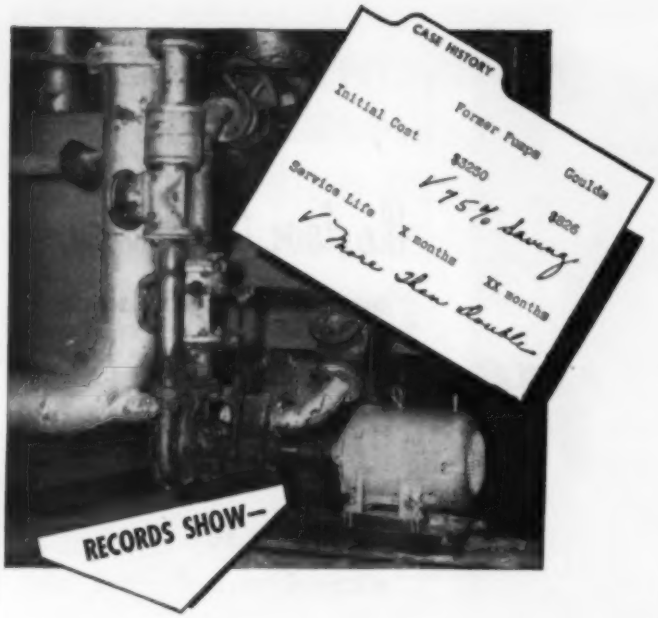

How a manufacturer cut costs tremendously with Goulds stainless steel pumps...

When handling corrosive liquids, pumps alone can be an important item in your processing budget. One alert plant engineer in the southwest cut his pump costs to about an eighth of what they had been.

The pumps he had been using for an especially erosive crystaline slurry cost $3250. When they wore out he replaced them with Goulds Stainless Steel Centrifugals for only $826. But this tremendous saving in initial cost was only half the pay-off. The Goulds pumps have already been in service *twice as long* as the ones they replaced . . . and they're still going strong.

The advanced design and simple construction of Goulds pumps make these savings possible. Bearings are prelubricated and fully protected. Stuffing boxes are under suction pressure to prevent leakage and assure long packing life. Parts are interchangeable. The impeller clearance can be adjusted for wear. Available in 9 sizes with capacities to 750 G.P.M. Send us the coupon today for full details.

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South Australia, are being explored by several big Australian companies, headed by the BHP, for the extraction of sulphur. It has been estimated that initial cost of plant for operations would be about $2 million.

Lurgi brown coal gasification plant to be installed in Australia by Lurgi Gesellschaft fur Warmetechnik, Frankfurt am Main, will operate at the highest pressure, 400 psi., of any such installation now in existence. The pressure increase will result in a gas of higher calorific value.

Six generators have been ordered by the state government of Victoria at a cost of $1.8 million for installation at the Morwell brown coal briquetting plant, 84 miles from Melbourne. The gas is to be piped to Melbourne for use as town gas. Future plans call for erection of an additional six units and for synthesis of liquid hydrocarbon fuels by the Fischer-Tropsch process.

Each of the generators is a jacketed cylindrical pressure vessel. Fuel is introduced through a lock chamber at the top, dried by rising reaction gases and carbonized as it passes down. At the base it reacts with a mixture of oxygen and steam introduced under pressure through a hollow shaft in a revolving grate at the bottom.

Oxygen of 95 percent purity is produced in a Linde-Frankl three-stage compressor plant. About 160 cu. ft. are required for each 1000 cu. ft. of purified gas. Each of the six units produces 3,000,000 cu. ft. of gas a day from about 3.5 tons of briquettes.

Principal constituents of the purified gas are hydrogen (59 percent), methane and carbon monoxide. Coal tar and benzene will be recovered from the crude gas.

Continuous updraft sintering plant for lead concentrates has been developed by Broken Hill Associated Smelters Pty. Ltd., Port Pirie, South Australia. Breaking with the worldwide practice of downdraft sintering, it marks the first major step in Australia towards tailoring metallurgical practice to the requirements of sulphuric acid production by the contact process. Although more combined sulphur is brought up with lead, zinc, copper and gold ores every year than could be used in Australia if it were available in elemental form, Australia's chemical industries are starved for sulphur and sulphuric acid. This is because most of the sulphur content of

metal ores is shipped abroad in concentrates, stockpiled or dissipated into the atmosphere with the roaster gases of mine smelters.

BHAS decided some time ago to do something about this waste of an increasingly scarce commodity and to install a contact sulphuric acid plant. Unhappily, the Dwight Lloyd downdraft sintering plant operating at Port Pirie did not produce a sulphur dioxide concentration acceptable to a contact plant. In the end, it was a consideration of fluidizing techniques which tipped the BHAS researchers off on a reversal of the direction of draft, on a principle of continuous operation.

A pilot plant with a daily input capacity of 50 tons was improvised from a powerhouse boiler stoker grate. The grate, traveling at a rate of 8-20 in. per minute, receives a shallow layer of charge from an ignition hopper. The layer is carried below the ignition stove where it is roasted by a downdraft. This downdraft served for igniting the charge only, after which the remainder of the charge is added to form the roast bed and the direction of airflow is reversed.

The pilot plant is producing a sinter of a smelting quality equal to that produced by the downdraft process, while giving better sulphur dioxide concentration without danger of dilution by ingress of air. About 80 percent of the eliminated sulphur is available in gas of 5 percent sulphur dioxide or better. To top it all, sinter production rate is considerably greater than by the downdraft process.

BHAS officials warn, however, that a valid assessment of the process will be possible only when the full-scale 77 by 10 ft. sintering plant, now on the drawing boards, is in operation.

GREAT BRITAIN

New carbon black plant of Cabot Carbon Ltd. at Ellesmere Port, Cheshire, is about to undergo an expansion which will double the total annual capacity bringing it to 40 million pounds.

Large sulphur plant is to be built soon at Fawley, near Southhampton by Esso Petroleum Co. Ltd. When in full operation early in 1953, it is expected to produce 12,000 tons of rock sulphur yearly. Almost all of it will be sold to the various sulphuric acid-using industries in Britain.

This project forms the third stage of construction at Esso's new $123

(Continued)

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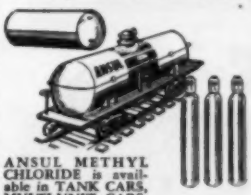

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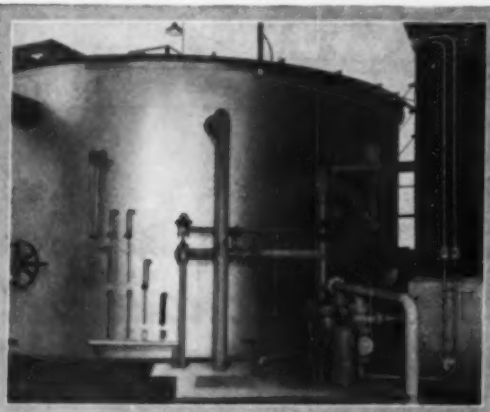

Cochrane-Liquon Sludge Contact Reactor at Power Plant in Texas. (left) Showing Automatic Desludger and Back-flusher, also Sampling Pipes. (Below) View of Reactor and Clearwell.

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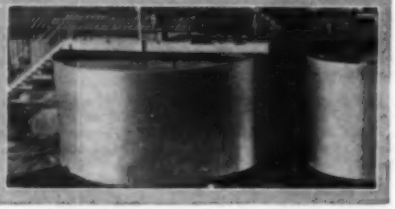

COCHRANE

million oil refinery at Fawley which aims at an annual output of more than .6 million tons of petroleum products. The sulphur extracted will help considerably in alleviating the acute shortage in the U. S.

The refinery has been designed to use as little sulphur as possible in its various treating processes. In fact, for a refinery of this size, Fawley may well have the lowest sulphur consumption of any in the world.

ITALY

Methane is now being successfully used instead of the gas producer coal product in the ceramic-baking oven of the Milan firm, Richard Ginori. The company claims it is more economical because: the gas generator with coal gas required the continued attention of a workman —this is not necessary with methane; there is no smoke.

The high temperatures necessary are obtained easily. Absence of sulphurous compounds from natural gas which eliminates the washing operation inevitable with coal is a real advantage in the working up of some types of ceramic. And it frees space previously taken up for storage of solid fuels.

PHILIPPINES

Chlorine is now being produced in quantities large enough to allow the Islands to dispense with imports. A newly installed $700,000 power plant is turning out six tons of chlorine and caustic soda daily for Superior Gas and Equipment Co. It will be used for water chlorination, bleaching and civil defense purposes.

Paper pulp plant is to be built in Davao to produce raw materials for a new paper bag factory recently opened in Naga, Cebu. Owner is the Cebu Portland Cement Co. Other pulp plants may be established in Negros, using sugar cane waste as raw material, and in other parts of Mindanao where raw material would be bamboo and timber.

ARGENTINA

Starch, glucose, alcohol and acetone will be salvaged from a surplus potato crop this year. This use of potatoes, new to Argentina, replaces consumption of costly corn in these chemical processes. Instituted to utilize a 150,000-ton excess, the emergency measure has the added advantage of making corn available for export, affording an opportunity to earn foreign exchange. —*End*

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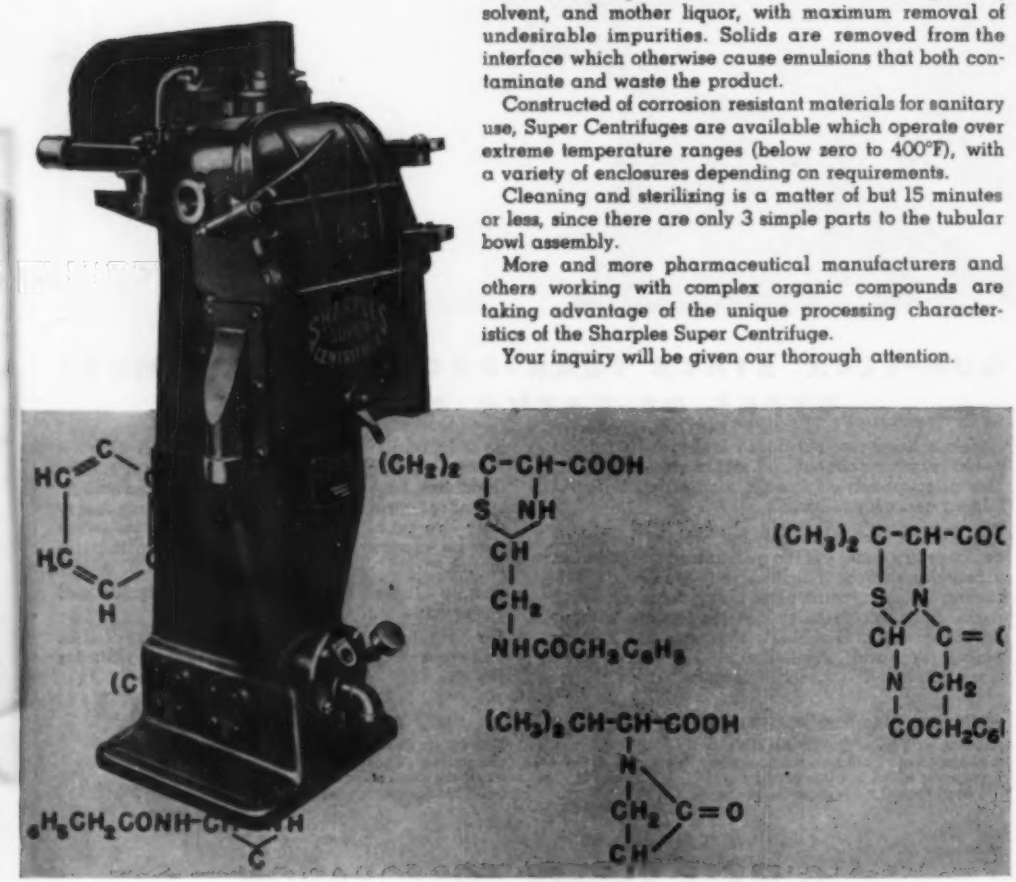

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Alcoa Heat Exchanger News

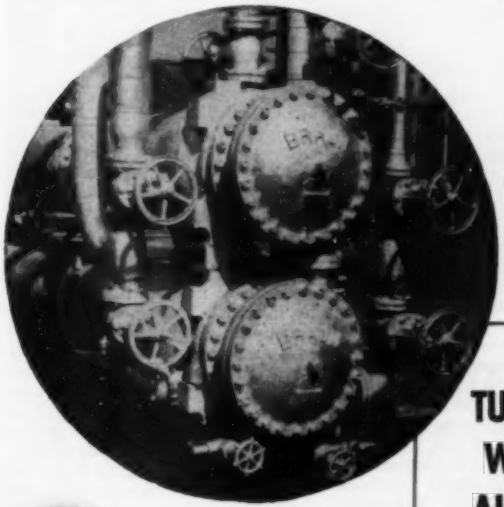
Rearmament needs severely limit the manufacture of aluminum heat exchanger tubes. But we realize that the purchase of refinery and processing equipment requires long study of economic and performance factors. That is the reason for this message.

Published by Aluminum Company of America

ALUMINUM TUBES SAVE THOUSANDS IN COST OF FURFURAL EXCHANGERS

. . . stay free of deposit, cut maintenance and down time

The furfural extraction process for lube oil presents some interesting heat exchanger problems. Copper, acting as a catalyst, polymerizes the furfural. The resulting hard, tenacious deposit requires frequent cleaning.



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Aluminum tubes are ideal for hundreds of chemical and petroleum applications, and Alclad 3S-H14 tubes are ideal where fresh, salt, or brackish cooling waters are encountered. They are the lowest cost commercial tubes you can buy.

Ask your local Alcoa specialist for more facts and figures to help you in long-range planning.

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This new, 24-page booklet will answer many of your questions about Alcoa Tubes. It covers fabrication techniques . . . alloy selection . . . applications both chemical and petroleum. It describes tube cleaning, the use of inhibitors and methods of cathodic protection. It contains complete information on fluid flow and heat transfer characteristics, plus tables of physical properties and specification data. Write for your free copy today: ALUMINUM COMPANY OF AMERICA 1860J Gulf Bldg., Pittsburgh 19, Pa.

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Aluminum tube sheets should be used wherever possible. For best corrosion resistance, use Alclad 4S-F Alloy Plate. For high operating pressures, use high tensile strength 61S-T6 Alloy Plate.

Existing commercial practices should be followed for tube hole spacing. Grooved tube holes may afford tighter tube joints, but are not necessary. Standard tools and techniques are used for rolling-in Alcoa Tubes.

The use of steel tube sheets is satisfactory in most fresh cooling waters. If necessary, cathodic protection may be provided in the form of zinc strips or zinc metalizing of the tube sheets.

Complete fabrication, installation and service information is contained in Alcoa's new booklet, "Alcoa Aluminum Heat Exchanger Tubes." Write for your free copy.

New high-temperature uses for sulphur step up search for economical materials.

Sulphur vs. Construction Materials

JAMES R. WEST, *Senior Fellow, Mellon Institute, Pittsburgh, Pa.*

NOTE: *In this second Corrosion Forum devoted to sulphur, we present first a revised article by Dr. West which appeared originally in the Oct. 1946 issue. The major change is a completely re-written section on stainless steel, bringing up to date the information about its resistance to sulphur.*

This is followed by short articles by other authors. Most of these deal with materials not covered by Dr. West.—EDITOR.

Transportation of sulphur in the molten state, vapor phase reactions of sulphur, and the use of sulphur vapor as a medium of heat transfer are all in the wind. But commercial utilization of these and other new developments will depend upon the existence of heat and sulphur resistant materials.

At present, cast iron and steel predominate in commercial usage, not because they are especially resistant, but because they are cheapest. There is no guarantee, however, that more economical materials could not be produced. It may be possible, for instance, to electroplate tantalum on a stainless steel and then anodize the tantalum. If the tantalum layer is dense and impervious, sulphur probably would not affect the surface since tantalum sulphide does not form when tantalum pentoxide is heated with sulphur.

That, however, is only one random possibility. There are many others. Much exploratory work needs to be done on sulphur-resistant materials for high temperatures.

It is the purpose of this report to serve as a starting point for such research by presenting a collection, as complete as possible, of all the information that industry and the literature have to offer on the subject.

Aluminum

All authorities agree that sulphur in liquid or vapor form does not attack aluminum. For example, laboratory data show that aluminum is not attacked by sulphur at 410 deg. F. or 770 deg. F. Aluminum has occasionally been recommended by its manufacturers for handling molten sulphur and sulphur vapor, and all reports on the resulting installations have been favorable. In a short trial, aluminum freight cars were used to transport sulphur and sulphur-bearing ores and coals without revealing appreciable corrosion; ordinary freight cars showed great wear by corrosion.

As the cost of aluminum decreases, it should be used more frequently in the handling of sulphur (e.g., pipelines and railroad cars), although it must be cautioned that aluminum containing sulphur-corrodible impurities is susceptible to corrosion by sulphur and is not suitable for such uses. While boiling sulphur has no effect on aluminum, the low melting point (1,218 deg. F.) of the latter renders it unusable for sulphur boilers and the like.

Cast Iron and Carbon Steel

The action of sulphur on steel is quite responsive to moisture, aeration, and temperature. Where all three of these factors are favorable—that is, where the molten sulphur is dry, unaerated, and at low temperature—steel and cast iron are suitable; but if any one of the three factors is unfavorable, excessive corrosion results.

Satisfactory service from iron and steel is recorded in a number of cases. Cast iron pump parts were found suitable where operated submerged in molten sulphur at temperatures up to 350 deg. F.; the original cast iron seats in these pumps failed after eight months service, but the new stainless Type 312 seats failed in only a week so that cast iron was again employed.

Liquid sulphur has been safely handled in tanks made of boiler-plate steel. The 1¼-mile-long main sulphur lines at the mines of the Texas Gulf Sulphur Co. are standard black pipe, now over twelve years old and apparently good for another twelve; their long life is attributed to the fact that no air, steam, or moisture is permitted to enter. Most recently at the University of Texas, an evaluation was made of the corrosion rates experienced during production of sulphur by the Frasch process in order to gain a better understanding of the mechanisms by which such corrosion occurs.

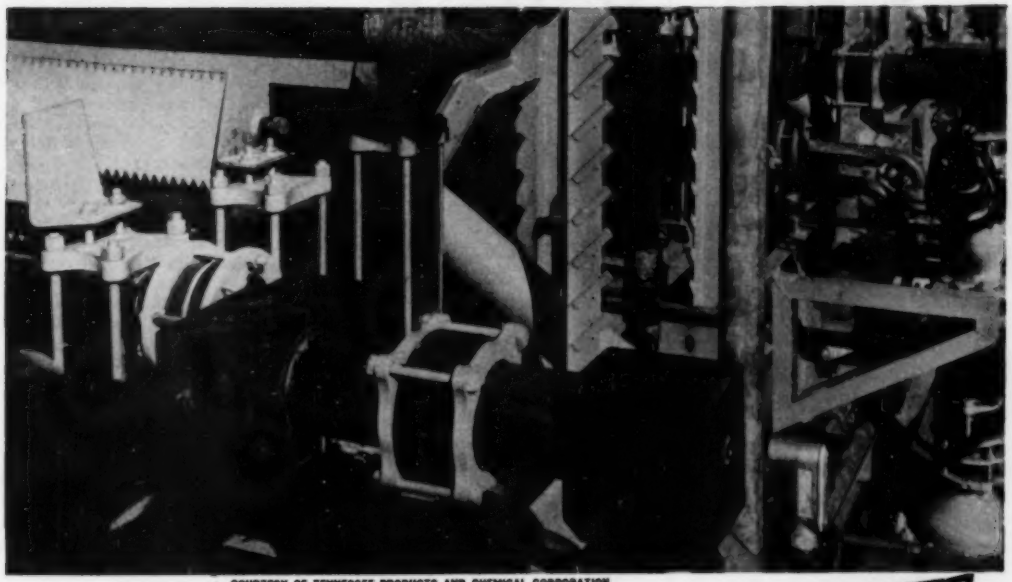
The effect of moisture in promoting corrosion of mild steel and cast iron by sulphur is pronounced and well established. Exposure of cast iron and steel specimens to sulphur containing 15 percent water for 134 days at room temperature resulted in almost complete destruction. The generally accepted explanation is that in the presence of moisture sulphur and atmospheric oxygen combine to give rise to the formation of acid. Wet, acid sulphur stored or transported in steel corrodes the latter rapidly even at room temperature, forming ferrous sulphide at points of contact.

Experiments have demonstrated that small amounts of ammonium carbonate added to wet sulphur not only neutralize present acidity, but go a long way toward preventing the future development of acidity in sulphur stock piles. Later tests have brought out that (at 100-132 deg. F. at least) moisture is the controlling factor in the corrosion of steel by sulphur and that the addition of ammonium bicarbonate materially reduces the amount of corrosion; thus, at 100 deg. F. (and no ammonium bicarbonate added) corrosion increases from around 1 mil/yr. at 0.5 percent mois-

(Continued)

QUESTION:

What pipe handles ALL corrosives?



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For conveying, processing and storing *all* types of corrosive liquids and gases, hot or cold, whole systems are now being built 100% with "Karbate" impervious graphite pipe, fittings, valves, pumps, heat exchangers, towers and other units needed. Here are the reasons:

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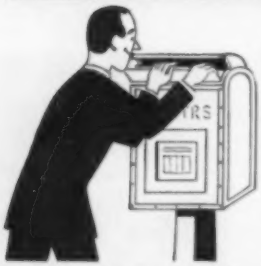
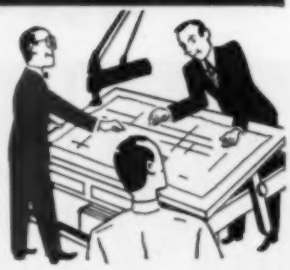
HOW TO SAVE TIME and MONEY IN BUYING DRYING EQUIPMENT

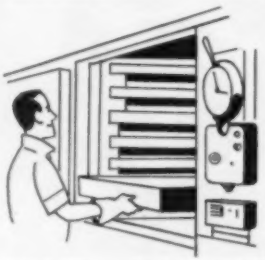


1 The first step in saving time and money in buying drying equipment is to become thoroughly acquainted with the Proctor approach to solving drying problems . . . by writing for Bulletins 343 and 361. These bulletins explain the way Proctor engineers tackle your problem.

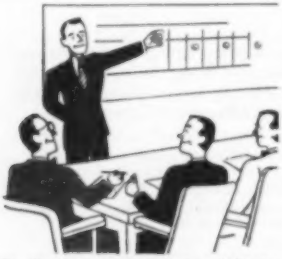


2 With this information as a background, consider your equipment needs just as soon as you know that drying is to be a part of your process. View that process as a whole, rather than select individual pieces of equipment separately.

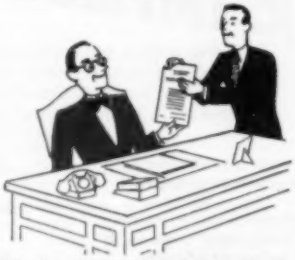
3 Pick up your telephone—or if that is inconvenient—dictate a letter outlining your problem. A Proctor engineer will be in touch with you to discuss it in detail and arrange for test work.



4 Tests will be conducted either in the Proctor laboratory—or if the nature of your product demands, in your own plant. The results will serve as a guide in making preliminary plans for equipment.



5 On the basis of the test work Proctor engineers will present recommendations on the size and type of equipment required to meet your needs. This equipment will be planned to serve as a major link in the over-all process.



6 Based on all of the test work and engineering that has been done—your sales contract will guarantee the performance of your Proctor system. You save time, money and are assured equipment that is "job-engineered" for you.

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ture content to 15 mils/yr. at 6.4 percent moisture and around 400 mils/yr. at 20 percent moisture. As to the value of adding ammonium bicarbonate, tests have indicated that at the lower moisture contents (under 5 percent) there is little point in adding more than 0.5 lb. per ton of sulphur, but at 20 percent moisture 0.5 lb./ton does little good. The addition of 50 lb./ton reduces the corrosion rate to from ½ to 1/15 of the value where none was added.

As to the effect of aeration, both experiment and experience show it to accelerate corrosion of iron and steel by sulphur. Thus, in one series of tests in molten sulphur at 260 deg. F., aeration increased the corrosion rate of cast iron from 8 mils/yr. to 45 mils/yr., and mild steel from 3 mils/yr. to 47 mils/yr. Also, it has been found in practice that cast iron and steel equipment handling liquid sulphur with otherwise reasonable maintenance suffers excessive attack at the liquid level.

The influence of temperature was demonstrated strikingly in a series of tests on cast iron in liquid sulphur at various temperatures; the corrosion rate rose steadily from less than 1 mil/yr. at 260 deg. F., through 27 mils/yr. at 500 deg. F., to over 400 mils/yr. at 830 deg. F. Steel would undoubtedly follow a similar course, and one test is recorded where boiler steel was destroyed by exposure to sulphur vapors at 1,300 deg. F. However, it is possible to raise the temperature limit for steel by surface treatment; boiler plate steel metallized with aluminum or chromium was found satisfactory up to 832 deg. F., and metal-sprayed tubes gave satisfaction in a sulphur condenser in which sulphur vapor entered at 832 deg. F. and in which cooling water entered at 80 and left at 190 deg. F.

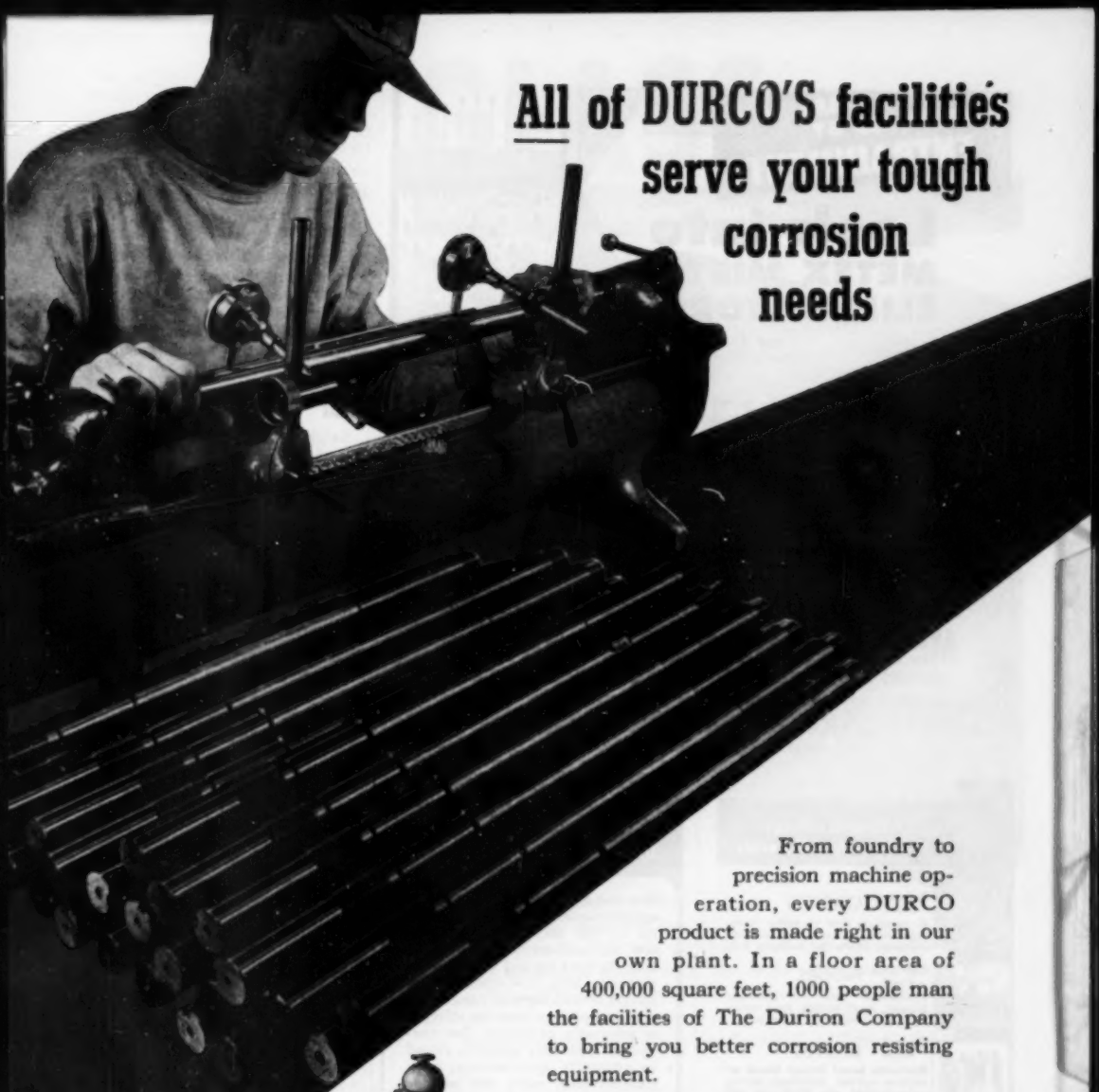
In summary, then, plain cast iron and mild steel may be used to handle solid and liquid sulphur at temperatures up to 350-400 deg. F., provided air is excluded from the liquid and moisture from the solid. However, the temperature limit may be raised to 830 deg. F. by metallizing with Cr or Al and the ill effects of moisture relieved by the addition of ammonium bicarbonate to the solid sulphur.

Silver, Silver Alloys

Silver is subject to attack by sulphur. It has been shown that the formation of silver sulphide is more spontaneous that that of the oxide if the partial pressure of sulphur in the

(Continued)

All of DURCO'S facilities serve your tough corrosion needs



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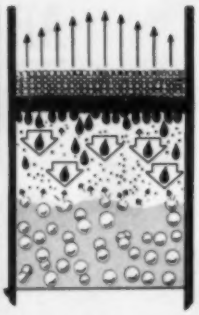

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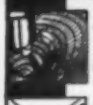

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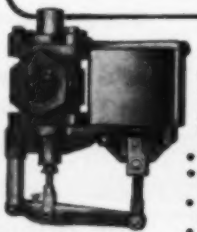

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The Johnson Corporation

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air is higher than (0.6 to 33.0) × 10^{-45}mm. Nothing has been reported on any silver alloy resistant to liquid or gaseous sulphur.

Cadmium

Cadmium has been used successfully in plants processing sulphur. One manufacturer has reported that cadmium plated equipment has proven more satisfactory than chromium plated metal for handling sulphur dust.

Lead

Sulphur reacts rather readily with lead. It is reported that strips of lead take fire in sulphur vapor and burn with a vivid glow to produce lead sulphide. If sulphur is mixed with molten lead the whole mass becomes red hot.

Obviously lead is not a likely candidate for use with sulphur.

Manganese

Manganese resists well the attack of sulphur as high as 750 deg. F.; the rate at 750 deg. is no greater than at 270 deg. F. Manganese has been alloyed with copper and these binary alloys have corrosion rates varying from that of manganese to that of copper. The corrosion rate of manganese has been measured as 2 mils/yr. at both 270 and 750 deg. F.; the addition of 10 percent copper doubled the rate at both temperatures, and 20 percent copper raised it to 7 mils/yr. at 270 and 9 mils/yr. at 750 deg. F.

Chromium

Experience has shown that sulphur and sulphides do not have an appreciable effect on chromium. A great deal of chromium-plated equipment is installed under conditions where it is subjected to the action of elementary sulphur, or sulphides, both plain and in aqueous solution, and at various temperatures. In all cases the chromium has performed with commercial satisfaction. It is regrettable, however, that no quantitative data have been recorded on the rate of attack or non-attack by such compounds.

Magnesium

Except for its comparatively low melting point (1,203.8 deg. F.) magnesium should be an excellent material for handling molten sulphur and sulphur vapor. The various references on this subject all agree that magnesium is inert to liquid or gas-

eous sulphur. Depending on economics, this metal should compete with aluminum for handling molten sulphur without corrosion.

Ceramics, Fused Silica

It is reported that chemical stoneware in the usual applications is not heated above 300 deg. F. and that, under these conditions, stoneware is not attacked by sulphur, sulphides, or polysulphides. Nothing more has been reported on the resistance of ceramic products to sulphur corrosion, except that sulphur attacks vitreous silica at about 1,830 deg. F. At lower temperatures silica shows toward sulphur its characteristic tendency to be rather inert.

Copper, Copper Alloys

Copper itself is completely unfit for use in handling sulphur; there is on record one case where the corrosion rate in five hours in molten sulphur at 284 deg. F. was 1.52 i.p.y., and another where a copper rod $\frac{1}{4}$ in. in dia. was dissolved completely in boiling sulphur in four hours—a rate of 322 i.p.y.

Copper alloys are a lot better than copper itself, but they still leave much to be desired. Molten sulphur at 266-284 deg. F., after one month, tarnished Tobin bronze and badly corroded brass. In tests conducted at 275 deg. F. red brass and low brass were attacked the least; aluminum bronze, nickel silver, and Muntz metal were almost as good. Admiralty metal, aluminum brass, and silicon bronze were next in order. All were quite resistant compared to copper.

In some experimental copper alloys, the addition of 2 percent tin halved the corrosion rate at 266 deg. F. and 5 percent decreased the rate to one third. Zinc proved even better; the same relative amounts as tin cut the corrosion rate to approximately one fourth and one tenth respectively. Two percent manganese decreased the rate to one seventh, and 5 percent reduced it to one eleventh, making manganese the best of the three. Ten percent manganese lowered the corrosion rate to about one twenty-sixth. At 752 deg. F. the corrosion rate of the manganese alloys increased only slightly over the comparable rate at 266 deg. F.

Nickel, Nickel Alloys

If free access of air is prevented, nickel and Monel are quite resistant to corrosion by molten sulphur at temperatures up to 575 deg. F. Above this temperature their corrosion rates increase sharply. The resistance of Inconel is reported good up to 690

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As Chemically Resistant as Chemical Glass Itself

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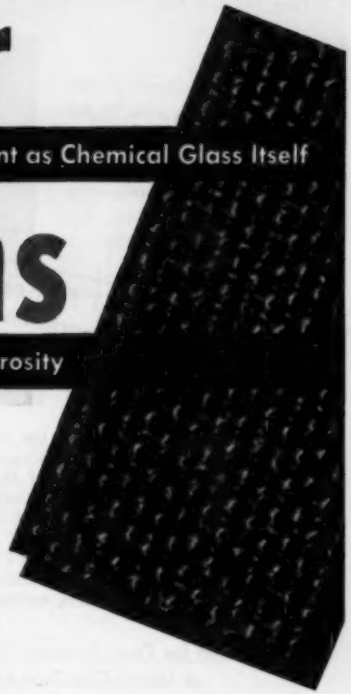
Various Degrees of Porosity



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PROBLEM:

HCL fumes were causing serious corrosion of pipes and structural steel as well as disintegration of the poured concrete walls and ceiling areas in the galvanizing department of a New England mill.

SOLUTION:

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Where Acids or Alkalies Destroy Prufcoat PROTECTS

Hydrochloric Acid Fumes in Galvanizing Department

. . . "Prufcoat has taken the job of protecting the metal and masonry in our galvanizing department out of the jinx job classification," the engineer in charge of this plant recently reported . . . "Before we Prufcoated our galvanizing department, we were forced to repaint this area every year and it looked as though it had never been painted after only six months."

Yes, performance records *prove* that where acids or alkalies destroy, *Prufcoat Protects* . . . on concrete floors, walls, ceilings, structural steel, pipes, tanks, ducts, machinery and equipment.

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Economical in original cost as well as in the preventive maintenance terms of positive protection against costly corrosion, Prufcoat Protective Coatings come ready-to-use in single, five and 55 gallon containers and are available in a wide range of attractive colors including green, buff, black, red, white, and several shades of gray.

An experienced Prufcoat corrosion engineer will gladly make a Preventive Maintenance Survey of *your* plant. No obligation, of course. ***Write today,*** *describing YOUR corrosion problems.*

New Prufcoat Metal-Reactive Primer P-10 . . . Does not require as complete surface cleaning as most other priming methods and works well on damp or dry surfaces. Makes possible a simple yet positive two-step system for corrosion-proofing old or moist metal surfaces . . . Write today for Prufcoat Technical Bulletin 012.

PRUFCOAT LABORATORIES, INC.
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Preventive Maintenance PAYS

deg. F. Ni-Resist is no more resistant to corrosion by molten sulphur than plain cast iron. The effect of temperature on corrosion of nickel and its alloys is indicated in the following data. As the temperature of the molten sulphur was raised from 565 to 835 deg. F., the corrosion rate of nickel went from 13 mils/yr. to 1,210 mils/yr.; Monel went from 36 mils/yr. to 1,300 mils/yr.; Inconel, the best of the lot, went from 0.8 mils/yr. to 36 mils/yr.; and Ni-Resist went from 131 mils/yr. to 592 mils/yr.

There was no aeration in these tests; if air is present, all the nickel alloys show higher rates of corrosion at and near the liquid level. No evidence of embrittlement was detected in any of the materials tested.

Platinum

Although platinum must be heated to very high temperatures before it reacts with sulphur, reaction has been known to occur during chemical analyses involving ignition, fusion, and evaporation. Because of its high cost, it is unlikely that platinum would be used unless it were absolutely untouched by sulphur and sulphur vapors.

Stainless Steel

All the conventional chromium and chromium nickel stainless steels resist liquid sulphur up to 400 deg. F., though at temperatures that low ordinary steel and cast iron are good enough to put alloy steels at an economic disadvantage. Steam jacketed gear pumps of conventional design, with the surfaces replaced by spraying with Colmonoy, have proved resistant to attack by liquid sulphur as well as to abrasion. Above 400 deg. F. the stainless steels have better sulphur resistance than unalloyed steels, but there is considerable disagreement as to the exact, and even the comparative, resistance values offered by the several types of chromium and chromium nickel alloy steels. Attention has recently been paid to the mechanism of the protective action of alloying elements in the sulphidic corrosion of iron.

It is a fairly general concensus that for service in liquid sulphur up to the boiling point, 17 percent chromium steel or stabilized 18-8 stainless will probably be satisfactory; but that operation at or above the boiling point (as in sulphur boiler tubes) requires higher alloys. For example, titanium stabilized 18-8 boiler tubes have been reported as failing where, in later tests, a 25-20 chromium nickel alloy gave indication that it might be satisfac-

tory. In the vaporization of sulphur one prominent company has shown increased life in successive operations employing Type 304 aluminized, Type 347 aluminized and finally Type 310 stainless steel. Sulphur vapor is transferred at 900 deg. F. in lines of Type 310 stainless steel or aluminized ½ percent molybdenum carbon steel. The experience of this organization would indicate that aluminization has little value when employing stainless steel.

For vapor service between the boiling point and about 1300 deg. F., the controversy centers primarily around the 25-20 chromium-nickel alloy, straight 27 chrome steel, and an alloy containing 27 chromium and 2 or 3 aluminum. This is in spite of the fact one report states that sulphur vapor above 1300 deg. F. has been successfully handled in an 18-8 coil which had been coated on the inside with aluminum by dipping.

In a service corrosion test performed in a stream of sulphur vapor at 1100 deg. F., alloys containing a total of 45 to 55 percent of nickel and chromium showed high resistance. Apparently the proportion of nickel to chromium exerted little influence on the resistance of the alloy. Any one of the alloys mentioned for vapor service could be expected to give adequate service, but no one of them has consistently proved best for all investigators. The preponderance of opinion, in point of corrosion resistance alone, seems to favor a high chrome steel over a chrome-nickel steel, and the chrome-aluminum steel over straight chromium. Unfortunately, high chrome steels, and especially the chrome-aluminum steels, show a tendency toward increasing brittleness with increasing alloy content.

Although the three steels above are mentioned most frequently for high-temperature resistance to sulphur, there are others that have been propounded. One containing Mo in addition to Cr and Ni and another with Mn and Cb as well as Cr have been recommended. Two rather special alloys, Illium G (21 Cr, 6 Fe, 6 Mo, 4 Cu, W, Mn, Si, balance Ni) and Hastelloy C (58 Ni, 17 Mo, 14 Cr, 6 Fe, 5 W) have shown up well in tests.

Experimental alloys—Al, Cr, Mn, V, Mo, W, and Cu have been added singly to iron in quantity sufficient to form a solid solution with the iron, and the resistance to sulphur at high temperatures studied. Resistance was increased by Al, Cr, or Mn, while V or Mo decreased it. A small amount of W increased resistance but large amounts decreased it. Copper, strangely, had no marked effect.

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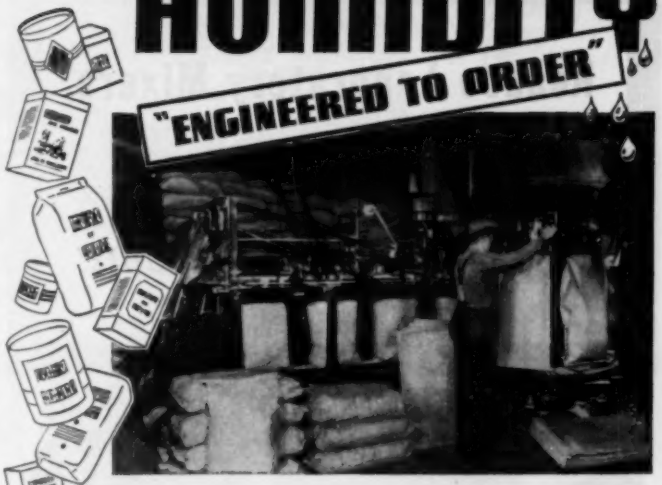
HUMIDITY

"ENGINEERED TO ORDER"



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Another investigation was concerned with the temperature range 1,300 to 1,830 deg. F. and with an alloy containing 61 Ni, 15 Cr, 20 Fe, and 4 Mn with addition of 0, 5, 10, and 15 percent Al. Loss in weight from sulphur attack was measured as a function of temperature and Al content. It revealed that at 1,300 deg. F. Al in quantities up to 15 percent has no effect on the sulphur resistance of this alloy. Above 1,300 the attack is materially lessened as the aluminum content is increased from 0 to 10 percent, and the higher the temperature the more steeply does the corrosion rate descend toward the value for the alloy with 10 percent Al. Increasing the quantity of Al above 10 percent adds nothing to the corrosion resistance.

ACKNOWLEDGMENTS

The writer is indebted to W. W. Duecker of Texas Gulf Sulphur Co. and to W. A. Hamor and L. H. Cretcher of Mellon Institute for encouragement and good advice in the preparation of this article. Thanks are given to Texas Gulf Sulphur Co. for permission to publish these data. Many industries, too numerous to mention, and the literature have made this compilation possible.

Worthite

W. E. PRATT, *Worthington Pump and Machinery Corp., Harrison, N. J.*

Worthite is not attacked by sulphur in the solid, molten, or vapor state. Since cast iron and steel are most commonly used for handling sulphur it is believed there will be a limited application for Worthite in this service.

Worthite has proved a most economical material for sulphur-burning nozzles, but the corrosive agent in this service is probably SO_3 rather than the molten sulphur itself. However, the toughness of the Worthite alloy in resisting the erosive action through the nozzle is a decided advantage.

Chlorimets

WALTER A. LUCE, *The Duriron Co., Dayton, Ohio*

Data on the corrosion resistance of Chlorimet 2 and Chlorimet 3 to molten sulphur are extremely limited but there is a definite indication that these alloys show low rates to very high temperatures. The high alloy content of these alloys usually provides them with inherent resistance to corrosives of this type. However, these alloys can only be produced at a relatively high cost which puts them at

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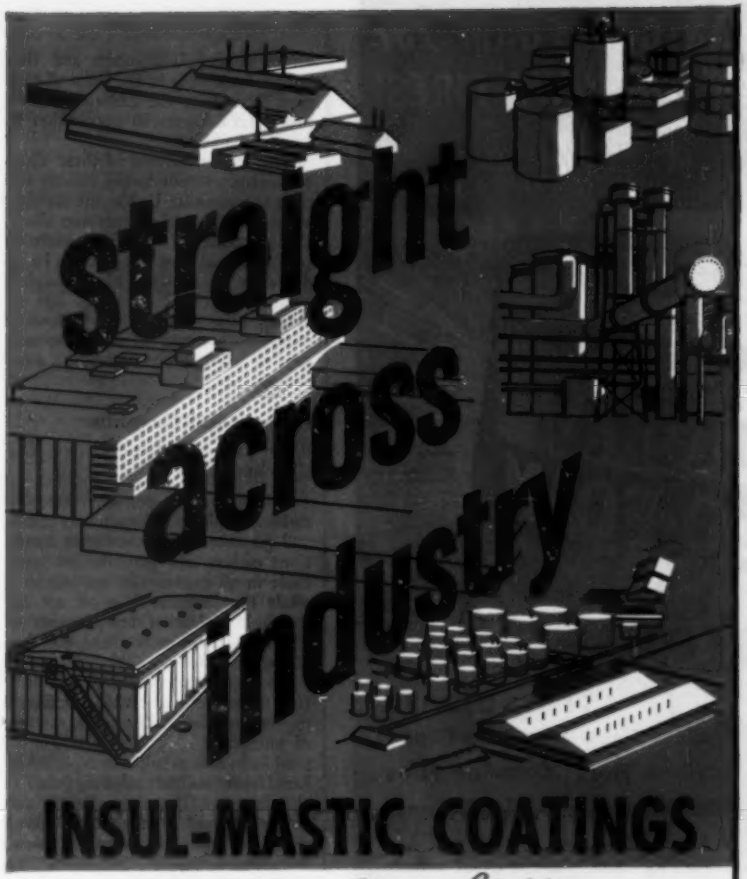

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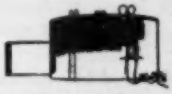

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an economic disadvantage and they are available only in the form of castings. Therefore, the Chlorimets have found no commercial application in sulphur handling.

The good resistance of these alloys to sulphur extends to the various sulphur compounds. Unlike the stainless alloys and the high-silicon iron alloys, the resistance of the Chlorimets to sulphuric acid does not seem to be reduced by the presence of the sulphur compounds. This advantage has resulted in the application of Chlorimet pumps and valves to sulphuric acid service containing reducing compounds.

Carbon and Graphite

R. O. JOSLYN, *National Carbon Co., Cleveland, Ohio*

Sulphur has no corrosive effect on carbon, graphite, or impervious carbon and graphite. Under reducing conditions carbon and graphite are applicable in all commercial temperatures, while the limitations in air are the threshold oxidation temperatures of 350 deg. C. for carbon and 400 deg. C. for graphite.

Steam-jacketed porous carbon tube type filters are used extensively for removing such impurities as the mixture of phosphate rock dust, fine Florida sand and calcium sulphate reported by Lee[1] from molten sulphur prior to atomizing and burning. Porous carbon is resistant to the thermal shock resulting from the steam backwash, and offers a superior supporting medium for the filter aid.

The melting of solid sulphur with indirect steam coils is a corrosion problem in many plants. A pilot installation of an impervious graphite plate type heat exchanger for this service is now in operation.

[1] Lee, J. A. Chemical Engineering, **58** (4), 119 (1948).

Cements

RAYMOND B. SEYMOUR, *Atlas Mineral Products Co., Mertztown, Pa.*

Because of its high melting point, molten sulphur cannot be stored in contact with thermoplastic cements such as those based on mixtures of sulphur and aggregates. While no practical experience is available, laboratory tests have shown cements based on phenolic resins and furfuryl alcohol resins to be completely resistant to molten sulphur at temperatures up to 350 deg. F. Silicate cements are resistant to molten sulphur at much higher temperatures.

Experience has shown molten sul-

phur to have very little effect on cast iron or steel in the absence of moisture but the presence of moisture causes fairly rapid attack. Cements based on silicate of soda cannot be used satisfactorily in the presence of sulphur and moisture; resinous cements based on phenol or furfuryl alcohol are not attacked under such conditions.

Coatings

KENNETH TATOR, *Kenneth Tator Associates, Coraopolis, Pa.*

Sulphur in its powder or lump form presents no or little corrosion problems and the usual materials of construction are satisfactorily used for its storage and transport.

As it melts at temperatures in excess of 240 deg. F. none of the rubbers or thermoplastics can be used for molten sulphur. The thermosetting phenolics and furanes will satisfactorily resist molten sulphur and the superheated steam often used as the heating and transport medium.

At temperatures in excess of 300 deg. F., as for the molten sulphur injection into a sulphur burner chamber, inorganic refractories and alloys should take over.

Durimet 20

WALTER A. LUCE, *The Duriron Co., Dayton, Ohio*

The high alloy stainless steel, Durimet 20, shows good resistance to molten sulphur at temperatures well above the normal melting point. The exact rate of attack depends to a great extent on additional factors such as moisture content. The presence of a substantial amount of moisture definitely tends to an increase in the amount of corrosion. Aeration, however, does not have the same noticeable effect as with chromium-free alloys. Contaminants such as sulphur chloride appear to increase the rate of corrosion on Durimet 20.

Conventional 18-8-S stainless steels apparently have at least equal corrosion resistance to Durimet 20 in molten sulphur as denoted by corrosion tests. The presence of moisture does not seem to alter this relationship. However, it appears from practical experience that Durimet 20 is a superior alloy for high velocity conditions such as are encountered in pumping operations. For instance, one company found that Durimet impellers improve the operating life of cast iron pumps handling dry, molten sulphur. In the presence of moisture an all-Durimet pump was utilized. Another chemical company uses pumps

(*Continued*)

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made entirely from Durimet 20 which at last report involves handling over 40 tons per day. Carpenter 20 tubing is also used in at least one instance to overcome liquid line corrosion on steel riser pipe for steam heaters.

Durimet 20 shows good resistance to solutions of the various sulphides, such as sodium sulphide. While certain of these sulphides in themselves are not corrosive, they may be responsible for increased corrosion when present as contaminants in other corrosive media. Hydrogen sulphide, carbon disulphide, and sulphur have been known to cause excessive attack on Durimet 20 in sulphuric acid. This is not surprising since any alloy which depends on the formation of a passive film for its resistance can be affected similarly. This breakdown of the passive film may be localized or occur over a large area.

High-Silicon Irons

WALTER A. LUCE, *The Duriron Co., Dayton, Ohio*

Although the high-silicon iron, Duriron, provides good resistance to molten sulphur, it is not ordinarily used for handling this corrosive. The acceptable service usually obtained from such materials as cast iron, steel and others is the principal reason for the limited application of Duriron. However, the fact that molten sulphur must be handled at relatively high temperatures also presents a problem since sudden, large temperature fluctuations are capable of causing breakage of Duriron equipment. This is a continual problem when operating at temperatures of 250 deg. F. and higher.

Despite the limitation cited above, Duriron kettles have found some application for melting sulphur. Heat shock was not a problem in these instances since temperature fluctuations were avoided. In one installation, no visible signs of corrosion were evident after one year's continuous operation. These service results were verified by laboratory tests. Sulphur vapors appear to have no corrosive effect on Duriron. However, the presence of such sulphur compounds as hydrogen sulphide and sulphur dioxide in substantial amounts may materially increase the rate of corrosion on the high-silicon iron alloys. In fact, hydrogen sulphide is capable of rendering Duriron an unsatisfactory alloy in sulphuric acid solutions where it normally exhibits a very low rate of attack. The mechanism of this unusual attack is explained by the failure of the normal passive film to develop in

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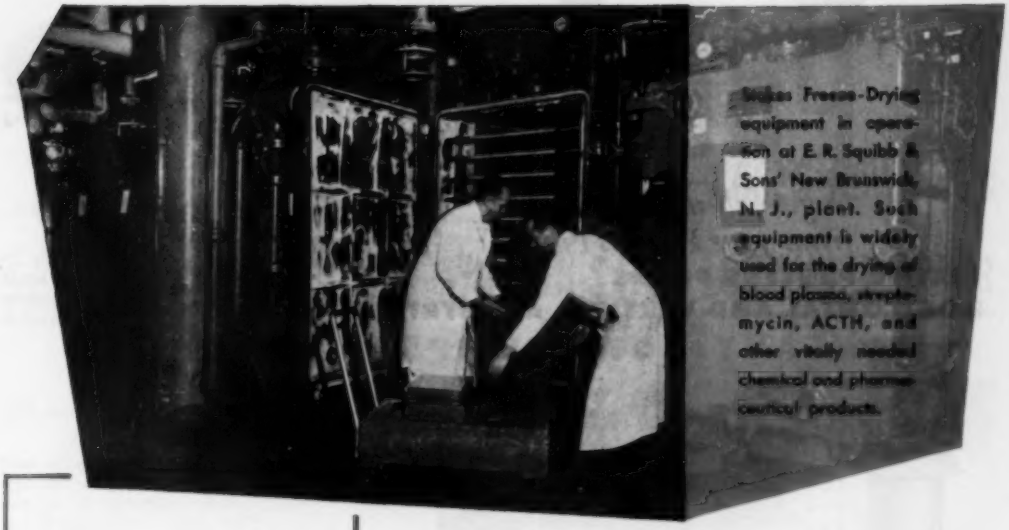

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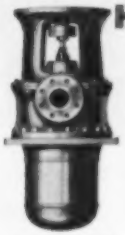
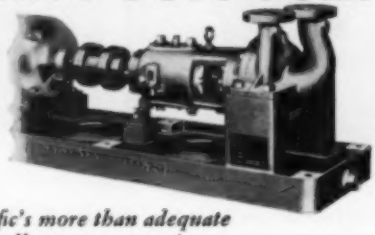
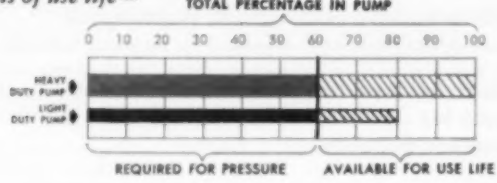




Here is what Pacific's more than adequate corrosion-erosion allowance means in terms of use life—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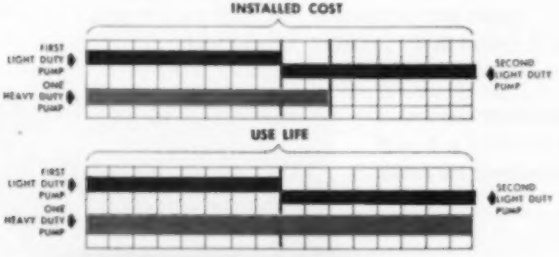

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the presence of this reducing gas. Fortunately, this is not a common situation and trouble is avoided by close appraisal of the proposed operating conditions.

Glass Lining

S. W. McCANN, *The Pfaudler Co., Rochester, N. Y.*

While glass-lined steel is fully resistant to sulphur in the solid, liquid or gaseous state, it is not ordinarily called upon to handle this chemical in the elemental state.

Rubber

J. P. McNAMEE, *U. S. Rubber Co., Providence, R. I.*

Rubber linings are very seldom used in contact with solid sulphur although they would be satisfactory for the purpose. They should not be used in contact with liquid sulphur.

Silicones

J. A. McHARD AND J. T. McINTYRE, *Dow Corning Corp., Midland, Mich.*

Laboratory tests show that all of the silicones are highly resistant to molten sulphur. These tests were conducted according to ASTM D543-43 at a temperature of 121 deg. C.

Silicone Elastomers—The results show that representative silicone rubber stocks are not attacked by molten sulphur. No changes in weight or volume were observed. Shore hardness and elasticity were practically unchanged.

Silicone Resins—No quantitative measure of the changes in weight and volume after exposure to sulphur is available for the various silicone resins. Visually there was no apparent change in size. Cured samples of the electrical insulating varnishes seemed to absorb small amounts of sulphur. This caused the resins which were originally clear to become cloudy. Two coating resins showed no change in physical appearance.

Tantalum

LEONARD R. SCRIBNER, *Fansteel Metallurgical Corp., N. Chicago, Ill.*

In the solid and molten stage up to the boiling point, no attack on tantalum by sulphur has ever been observed. J. H. Payne at Ohio State University, in a report dated Nov. 25, 1941, mentioned that boiling sulphur and hot sulphur vapor tarnish tantalum, cause it to become springy, and cause a loss in weight.

—*End*

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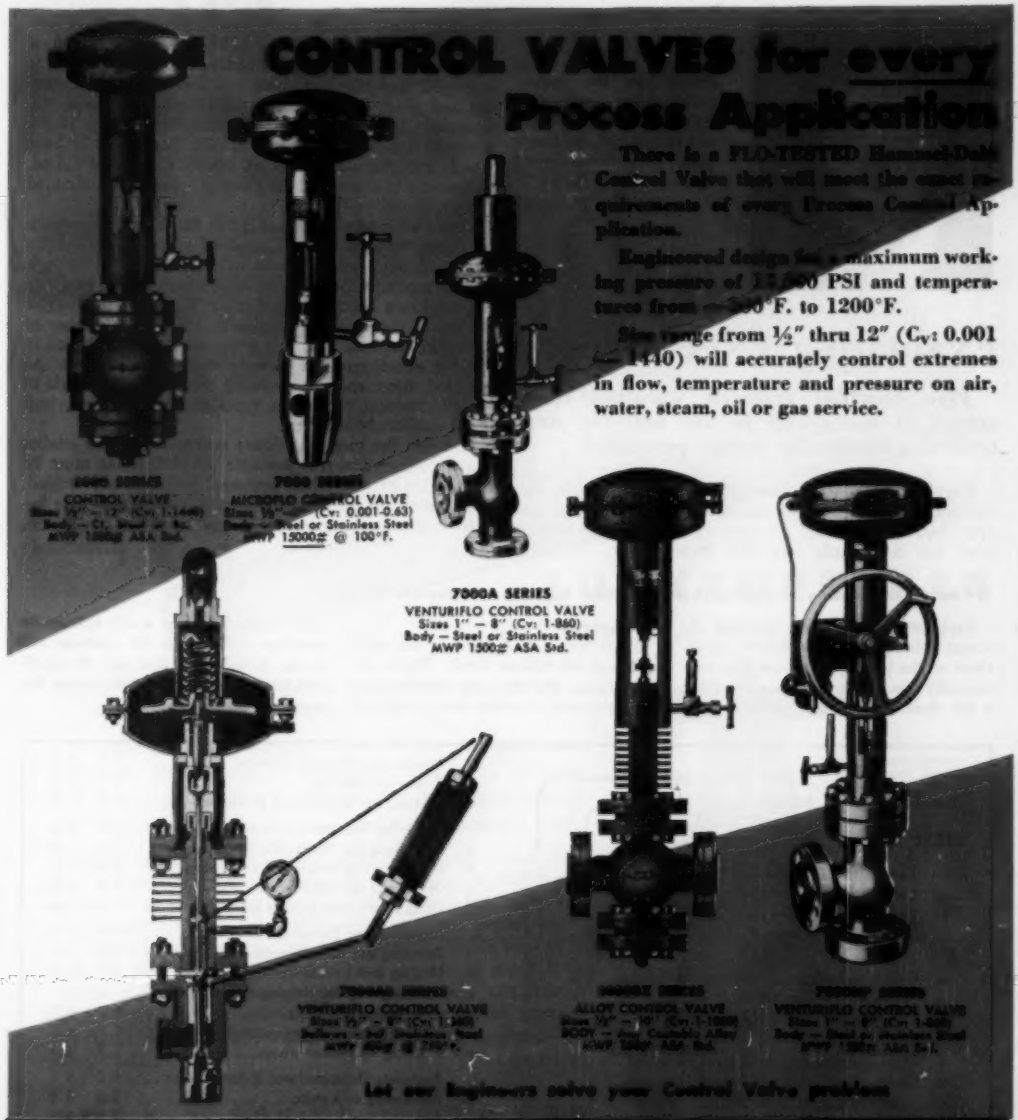

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—John C. Flanagan

Evaluating Executives

Five hundred research scientists have served as test group in the first big step toward scientifically rating personnel.

Roger Q. Forsythe, research administrator, was told one morning that one of his subordinates, a section supervisor, had recommended for promotion a laboratory worker who was notoriously lazy and incompetent. Without obtaining the complete story or checking the facts, the administrator summoned his subordinate and began a severe reprimand. During the course of this reprimand, it developed that the complaint was based on misinformation and that the subordinate supervisor was completely innocent. Thereupon, the administrator merely stated he would look into the matter further. Several weeks have passed, and the incident is apparently considered closed. The subordinate was left dangling in a justifiably offended frame of mind.

This is an example of what is not desirable in a research executive. It is part of a system of personnel evaluation developed by psychologists who were fortunate enough to have access to the great establishment of men, methods and machines brought together by World War II. The urgency of the wartime problem and the large number of personnel involved, gave this group an excellent chance to test the effectiveness of many personnel procedures. As expected, these researches proved some practices, such as the effectiveness of certain types of aptitude tests, and raised doubts about others.

Probably the most significant outcome of these studies was the realization that accurate job definitions must be evolved before any other personnel problems are tackled. This means simply that if it is not known in precise behavior terms what an individual is supposed to do,

(*Continued*)

What distinguishes a top-level researcher from a middle-level man?

Explanation of the table: Qualified observers were asked to study research supervisors on the job, report actions that were especially effective or ineffective in getting a job done. Altogether, 2,500 of these were reported.

These were boiled down to the eight areas and subdivisions listed. Figures are percentages. Hypothetically assuming that the eight areas combined were mentioned 1,000 times, 5 percent would indicate 50 mentions, 6.9 percent 69 mentions and so on. A difference that may be significant occurs in Area 6, "Administering Research Projects."

ITEM	Highest salary personnel	Middle salary personnel
1. Formulating Problems and Hypotheses	5.0	6.9
a. Identifying and exploring problems	1.4	2.6
b. Defining the problem	2.0	2.6
c. Setting up hypotheses	1.6	1.7
2. Planning, Designing the Investigation	15.6	11.3
a. Collecting background information	5.0	5.2
b. Setting up assumptions	.6	.9
c. Identifying & controlling important variables	2.0	2.6
d. Developing systematic & inclusive plans	3.1	1.7
e. Developing plans for the use of equipment, materials, or techniques	3.1	.9
f. Anticipating difficulties	1.6	.0
g. Determining the number of observations	.2	.0
3. Conducting the Investigation	18.2	20.8
a. Developing methods, materials, or equip.	7.5	11.3
b. Applying methods and techniques	3.0	2.6
c. Modifying planned procedures	1.4	.9
d. Applying theory	3.1	3.5
e. Attending to and checking details	3.1	1.7
f. Analyzing the data	.3	.9
4. Interpreting Research Results	5.3	3.5
a. Evaluating findings	3.7	3.5
b. Pointing out implications of data	1.6	.0
5. Preparing Reports	9.2	5.2
a. Describing and illustrating work	2.5	.0
b. Substantiating procedures and findings	3.4	1.7
c. Organizing the report	3.0	2.6
d. Using appropriate style in presenting report	.3	.9
6. Administering Research Projects	27.0	33.9
a. Selecting and training personnel	5.9	6.1
b. Dealing with subordinates	9.5	10.4
c. Planning and coordinating the work of groups	6.2	8.7
d. Making administrative decisions	2.7	4.3
e. Working with other groups	2.7	4.3
7. Accepting Organizational Responsibility	9.2	9.6
a. Performing own work	3.0	3.5
b. Assisting in the work of others	3.0	4.3
c. Subordinating personal interests	1.7	.9
d. Accepting regulations and supervision	1.6	.9
8. Accepting Personal Responsibility	10.3	8.7
a. Adapting to associates	1.2	1.7
b. Adapting to job demands	3.9	2.6
c. Meeting personal commitments	.5	.9
d. Being fair and ethical	3.4	.9
e. Showing interest in work	1.2	2.6

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"Causul" metal is an austenitic iron, containing nickel, copper, chromium, and molybdenum. It has over twice the deflection of highest quality gray iron, and is free from the brittleness of high silicon, acid-resisting irons. Monel metal or Type-316 stainless steel trim is available. Write today for Circular 592, an eight-page brochure describing more than 100 of the many special corrosive services you can handle and the trim combinations that will give you the greatest economy. Address: The Lunkenheimer Company, Box 360S, Cincinnati 14, Ohio.

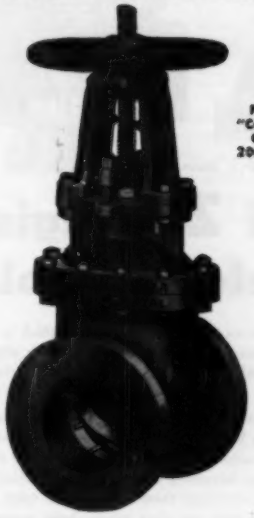

Figure 1639
"Causul" Metal
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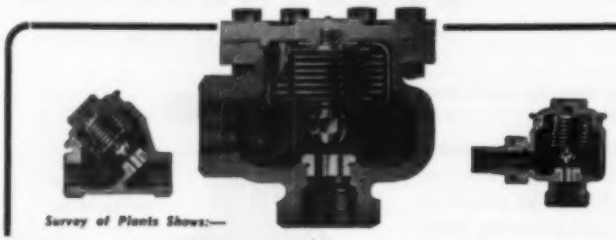

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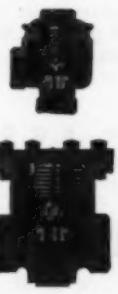
15 of 20 Engineers Prefer Nicholson Traps

To determine the best steam trap on which to standardize, a large processing firm recently asked their plant engineers for their preference. In 15 out of 20 plants the choice was Nicholson.

The repeated adoption of Nicholson steam traps in plants currently in big "cost-reduction-through-modernization" programs is another indication of their advanced features. To learn why an increasing number of leading plants are standardizing on Nicholson thermostatic steam traps send for our catalog. 5 types for every power, heat, process use; size ¼" to 2"; press. to 225 lbs.



Catalog 751 or see Sweet's

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including a description of the specific ways in which he may succeed or fail, it is impossible to evaluate any part of the personnel problem concerned with this individual.

This need led to the concept of "critical requirements," those that are crucial in the sense that they have been frequently observed to make the difference between success or failure in that activity. These critical requirements are a substitute for the long lists of traits, duties and requirements for various jobs. In the past, these, in many cases, were more comprehensive than they were enlightening.

An efficient technique for determining critical requirements has also been developed. This technique, called the "critical incident" technique, tends to substitute data for impressions and opinions. It provides a relatively precise and comprehensive definition of effectiveness on a job in terms of what people actually do on this job. The critical incidents are reports by qualified observers of things done that were especially effective or ineffective in accomplishing important parts of their jobs. The vague hunches, the stereotypes, and the poorly defined traits such as character, imagination, and foresight are replaced by reports of observed incidents which are detailed and specific.

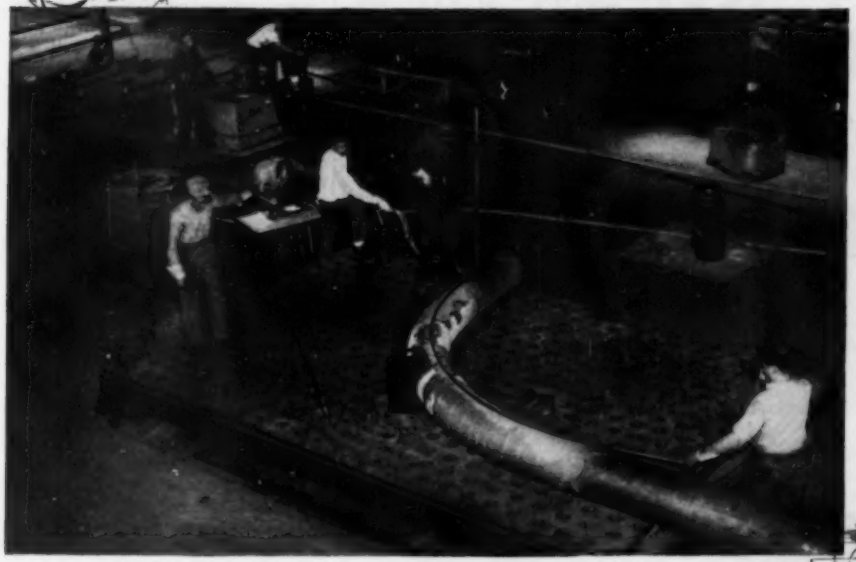
To illustrate the technique and report some data for the research executive, limited figures are available from a study of research personnel carried out by the American Institute for Research. The study was sponsored by the Office of Naval Research.

In this study, critical incidents were obtained from five hundred scientists in twenty research laboratories. About twenty-five hundred incidents were reported by supervisors describing something that a research worker did which was especially effective or ineffective in getting his job done. The chart indicates that the greatest differences between top level research executives and those in the next grades are in Area 1 "Formulating Problems and Hypotheses," and Area 6, "Administering Research Projects."

Within the first area, the critical behaviors observed regarding the research executives included identifying and exploring problems, defining the problem, and setting up hypotheses. But the behavior most distinctive of the top level research executive as compared with his subordinates was identifying and exploring problems. In the area concerned with administering research projects, all the subcategories appear to be important fac-

(Continued)

From interpretation to installation . . .



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tors in evaluating the effectiveness of the research executive. These included: selecting and training personnel, dealing with subordinates, planning and coordinating the work of groups, making administrative decisions, and working with other groups. These types of behavior are also critical for research personnel on the next lower levels. The administrative subcategory in which responsibility appears to be most frequently shared with the next lower level of research supervision is that of selecting and training personnel.

A few examples illustrating the behavior of research executives are given below. The first incident illustrates ineffective behavior on the part of a supervisor in one of the lower grades of research supervision. Data of this type should be valuable in deciding whom to promote to higher supervisory positions:

> This supervisor refused to accept the recommendations made by a shop foreman to simplify and improve the design of a new supporting bracket. The supervisor had assigned the project to a subordinate who was inexperienced in mechanical design and did little research prior to issuing the plan. The supervisor did not spend any time assisting his subordinate or laying down any general requirements but gave him the job to do completely. The foreman's idea was approved by the supervisor's superior but discarded by the supervisor because he felt the "production department had no business telling him what to do." This inflexible attitude kept production forces away from him, wasted time and effort, and produced a poorer product.

The second example illustrates effective behavior on the part of an administrator having to do with supervising personnel:

> A division head learned indirectly of the success of one of his subordinates in obtaining qualifications under a Civil Service Examination after a long period of delay, correspondence, and appeal. Recognizing the importance of this event to the subordinate concerned, he immediately contacted the man and invited him to his office for interview. Upon arrival, the man was warmly congratulated, given assistance and suggestions in connection with the final routines necessary to certification and then complimented on the work he was doing. Discussion of the latter followed and resulted in beneficial

suggestions for pursuance of the problem. In doing so, the division head gratified his subordinate, made him feel that his place in the organization was important, and inspired him to a greater degree of effort and initiative. Thus, the over-all progress and effectivness of both the individual and the institution was measurably enhanced at the expenditure of only a few minutes of the executive's time.

From the data gathered, it appears that effectiveness of performance with regard to the type of administrative detail involved in staff work, such as checking, record-keeping, getting information and keeping others informed are not reported as critical behaviors for either of these types of executives. Proficiency in administrative detail does not appear to be a critical requirement for their positions.

On the other hand, the general area designated "Supervising Personnel" or "Dealing with Subordinates" is a substantially critical factor. Proficiency in planning, initiating, and directing action include the largest proportion of the critical incidents reported regarding both types of executives.

It should be emphasized that the relative frequency of critical incidents of either an effective or ineffective nature is not an indication of superiority or inferiority of one group over the other in the comparisons discussed above. It is merely an indication of the extent to which the problems and activities in a particular area lead to critical behaviors as observed by the reporting research workers.

The foregoing analysis should be regarded as a pilot study. Although several thousand incidents were collected, the number relating to men in high-level executive positions was only something more than a hundred. For an adequate study, it would be desirable to collect a few thousand incidents.

In establishing the critical requirements in terms of actual job behavior for the research executive, five specific conditions must be satisfied if valid results are to be obtained. These are as follows:

1. It is essential that actual observations be made of the on-the-job activity and the product of such activity.

2. The aims and objectives of the activity must be known to the observer. Unless this condition is fulfilled, it will be impossible for the observer or judge to identify success or failure. For example, a research director might be rated as very successful if the objective of his activity were taken as getting along well with

(Continued)

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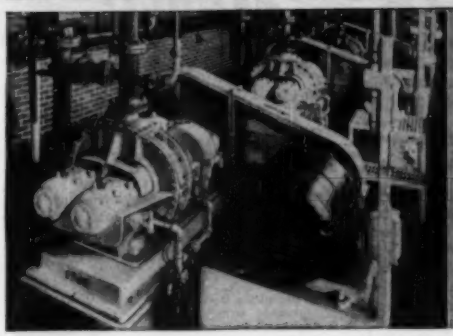

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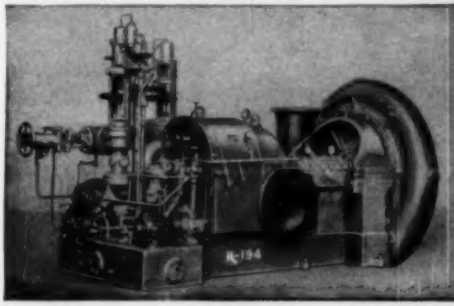

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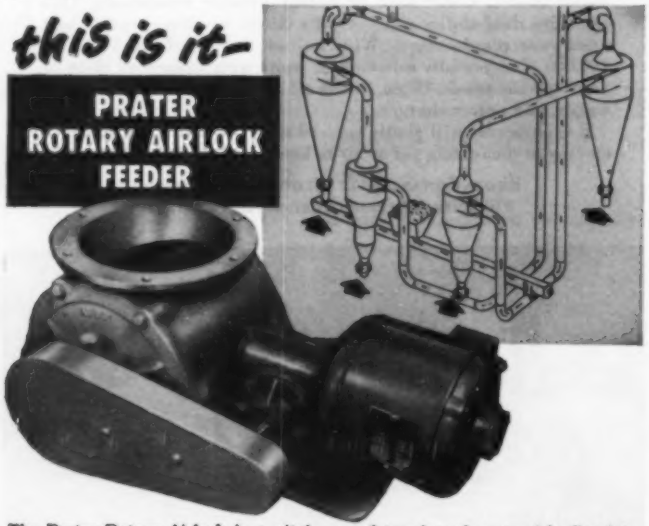

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the men under him. At the same time, he might be rated as very unsatisfactory if the objective were the quality and quantity of research that was accomplished.

3. The basis for the specific judgments to be made by the observer must be clearly defined. The data can be objective only if all observers have the same criteria for making judgments. For example, the definition must clearly state whether or not a minor imperfection will be regarded as evidence of failure or whether the results must be completely unusable to be classified as unsatisfactory.

4. The observer must be qualified to make judgments regarding the activity observed. Typically, the supervisor on the job is in a much better position to make a judgment as to whether behavior is outstanding or unsatisfactory than is the job analyst or psychologist. On the other hand, the supervisor on the job is ordinarily lacking in the training essential to make an inference as to the particular mental trait which caused the behavior to be successful or to be unsuccessful.

5. The last necessary condition is that reporting be accurate. The principal problems here are those of memory and communication. It is also important that the observer's attention be directed to the essential aspects of the behavior being observed.

Even with a very careful formulation of our procedures and the use of large samples, the problems involved in studying human behavior are great, and our results must usually be reported in terms of probabilities which are very far from certainties. Recent studies have demonstrated that improved techniques such as the "critical incident technique" can provide data of verifiable predictive value. The day of expert opinion regarding problems of selection and classification, training needs, job requirements, the evaluation of performance, and job design is coming to a close. Research of the type which enables the personnel psychologist to stand on the shoulders of the preceding contributors in this field is taking over. Much work needs to be done, but we can predict with confidence that in the next few years it will become possible to read a paper stating clearly, and with known precision, the needs of the research executive.

John C. Flanagan is president and director of research for the American Institute for Research, a non-profit organization conducting investigations into the effective use of human resources. The foregoing article is based on a paper he delivered at the Fourth Annual Conference on the Administration of Research of the University of Michigan.

Keep your eye on the ball

An old duffer told us that.
He'd say, "If you're going to hit that ball, you've got to know where it is — all the time."

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No, we can't sell you any now.
Because our customers of record come first.
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Bailey Control for Rotary Kilns gives you better performance three ways:

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2. Uniform Quality of Product
3. Reduced Maintenance

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With Bailey Combustion Control you can be certain that you are getting maximum product for every unit of fuel you burn. Bailey Control closely guards the Fuel-Air Ratio, Hood Draft, Fuel Feed, Clinker Cooling and the Temperature of Air for Combustion.

UNIFORM QUALITY OF PRODUCT

Bailey Instruments and Controls can help you achieve a uniform high grade product. Measurements of temperatures, kiln speed, combustibles content, and oxygen content can be transmitted to recorders on centrally located control boards like the one shown. There is no sacrifice of accuracy or speed of response. High temperature alarm contacts may also be provided with Bailey Pyrometers as a further aid in achieving optimum uniformity of product.

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It would take six 16-point recorders—each with its own chart—to give the same information which is concentrated on the one chart of the 100-point Speedomax Recorder shown above. Reading one chart instead of six saves time—a busy man can check temperatures more often. The danger of mistakes resulting from a comparison of six separate charts is eliminated.

Minimized Cost Per Thermocouple Point

Instrument cost per point recorded is less than that for any other L&N recorder! Panel space is reduced by two-thirds. Scanning of 100 points during a heat balance check requires only six minutes, forty seconds. If, like Esso, you are interested in only 20 of the 100 temperatures as long as the process is operating smoothly, you can read them in only 80 seconds.

You need not provide for 100 thermocouples unless you need them, since instrument capacities range from 40 to 160 points. Four types of operation are always at hand:

1. **Continuous Indicating but no Recording.** All points are indicated in succession.
2. **Automatic START-STOP.** In this type of operation, a specified temperature limit is set. As long as no thermocouple point exceeds this limit, the Speedomax simply indicates. But if any point should exceed the limit, automatic recording of all points begins and an alarm is sounded to summon the operator. Thermocouple connections are grouped in banks of 20, and a different temperature limit can be set for each bank.
3. **Continuous Recording.** Automatic recording of all points.
4. **Selective Indicating or Recording.** Indicating or recording of any bank, combination of banks, or single point.

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Names in the News Edited by Frances Arne

MAN OF THE MONTH: Walter G. Whitman

MIT's chemical engineering head, now on loan to the government as chairman of the research and development board.

Walter G. Whitman graduated from the Winthrop, Mass., high school wavering between a career in electrical or chemical engineering. It happened that his high school physics and chemistry teacher, a charming and persuasive lady who stood 6 ft. 2 in. in flat heels and weighed approximately 13 stone, bore the heaviest influence. He decided on chemical engineering.

In 1920 he completed work on his M.S. at MIT. Concurrently with his degree work, he had served as assistant instructor in chemical engineering. He was an assistant professor from 1920 through 1925.

The next nine years were spent at Standard Oil (Indiana) as assistant, then associate director of research. Up to his arrival at Standard, Professor Whitman had expressed himself musically with the fiddle. But just about that time the company's guitar player, who accompanied community sings, was fired. Professor Whitman volunteered for the slot. A fireman on the night shift at the firehouse gave him three lessons and to this day his favorite recreation is accompanying group singing.

He returned to MIT in his present post as professor and head of the department of chemical engineering in 1934. While best known in chemical engineering circles for his two-film theory of gas absorptions, Professor Whitman feels himself that a more pertinent paper is one he prepared shortly before World War II entitled "Liquid Fuel Supply and National Resources." The predictions of this paper have been largely fulfilled. Consultant to and committeeman in many scientific activities, he served during World War II with the WPB in charge of the basic chemicals division.

Mrs. Whitman is Alabama-born and the family makes frequent trips to her homeland. On one memorable visit Professor Whitman was pressed into service as a deputy sheriff to help investigate rumors of moonshining. Officially outfitted with pistol, spurs, and badge, he rode with a posse into the hills. But he has to admit that no angry shots were fired and the chase came to its traditional conclusion: the merchandise proved potable enough to confiscate.

H. R. Legatski. From superintendent of operations to project development engineer, Phillips Chemical Co.

Charles N. Kimberlin, Jr. Senior Research associate, Esso Laboratories, Baton Rouge. Joined Esso in 1933. Graduate of Louisiana State.

J. D. Clary. Superintendent of the specialty catalyst plant operated at Curtis Bay, Md., by Davison Chemical Corp. Formerly technical director for Chemical Products Corp., Cartersville, Ga. Studied chemistry at Emory and Ohio State (Ph.D., 1938). **Albert H. Cooper:** head of the research engineering department of the research and development division. Formerly professor and head of the department of chemical engineering, Bucknell. Graduate of the University of Tennessee and Michigan State. **Walter K. O'Loughlin:** manager of the development department of the research and development division. Previous employers: Commercial Solvents; intelligence department of the Air Forces. Graduate of Catholic University. **Kenneth E. Prince:** head of the patent department, research and development division. Formerly patent solicitor for Phillips Petroleum. Studied chemistry at the University of South Carolina and law at the Chattanooga College of Law.

C. K. Banks. Vice president in charge of research, Metal & Thermit Corp. Has been director of research since 1949. Formerly headed the chemotheropy division of Parke-Davis.

Myron L. Bender. From AEC postdoctoral fellow to instructor in chemistry at Illinois Institute of Technology. Graduate of Purdue.

Carl O. Hoyer. Director, general engineering department, Chemstrand Corp., has been division engineer in charge of design and maintenance for Monsanto since 1944. With Monsanto since 1934. Graduate of Washington University.

C. O. Hoyer

C. G. Stupp

Charles G. Stupp. From technical supervisor for manufacturing to technical director, Barrett Division,

(Continued)

Here's what we meant by

Need help IN MAKING FILTERAIDS GO FARTHER?

A survey by a Dicalite Engineer enabled this manufacturer to cut filteraid usage by 66⅔% per gallon of throughput

One of the many products in this manufacturer's line is varnish. It was being filtered by precoat only, using 100 lbs. of filteraid to deposit on the cloths of a 200-sq. ft. plate and frame press before starting to filter each 1000-gal. batch. A survey by a Dicalite engineer led to saving both time and filteraid. First, a switch was made to a higher-flowing grade of Dicalite filteraid. Only 25 lbs. of this material (Dicalite 4200) was used for the precoat, but 75 lbs. were used in continuous addition to the varnish as it was being filtered. In this way 3,000 gallons were filtered with satisfactory clarity before the press needed cleaning. RESULT: 1) 100 lbs. of Dicalite filtered 3,000 gallons instead of the 1,000 gallons put through by the former method; 2) cycle length was tripled, so that two press cleanings were eliminated in filtering 3,000 gallons and saved considerable down time and overtime. Such spectacular savings are not always possible, but our engineers find many cases where filteraid consumption could be reduced 10% to 15% without any ill effects to operation or product quality. If you feel that a check of your filtration operation or stretching your available supply of filteraid will be helpful, or if you have a current filteration problem, write our nearest office. A Dicalite engineer will gladly call at your convenience.

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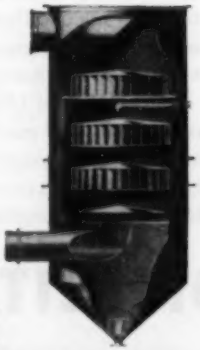

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NAMES IN THE NEWS, cont. . .

During World War II, works manager for Barrett's chemical plant in Philadelphia. Came to division in 1916. Cornell graduate.

William A. Weber. Assistant chief plant engineer in the dye departments at the Calco Chemical Division of American Cyanamid. With company for 27 years, most recently as assistant plant engineer. Rutgers graduate.

R. E. Greenfield. From general superintendent to vice president in charge of manufacturing, A. E. Staley Mfg. Co. Member of the board of directors since 1947.

Harold E. Weisberg. Technical director, Mineral Pigments Corp., Muirkirk, Md. Has been president of the Universal Pigments and Chemical Corp. for the past five years. Formerly with Ansbacher-Siegle and Reichhold Chemical.

Harlow R. Brigham. Assistant superintendent in charge of product improvement activities in the color control division at Eastman Kodak's Kodak Park plant. Joined company in 1929 as a research chemist. Graduate of Michigan State.

Gus Kaufman. Assistant manager, technical and research division, Texas Co. With company since 1924, most recently as staff technologist and assistant to the manager of the technical and research division, New York. Graduate of Rice Institute.

John D. Zech. Group leader, organic section, Atlas Powder Co.'s central research laboratory. Doctorate in organic chemistry, Pennsylvania State College, 1939. Subsequent employers: Socony-Vacuum research laboratories; Devoe & Raynolds; J. T. Baker.

Ralph M. Stevenson. Chief, essential oil, flavor materials and perfume materials section, chemical and drugs branch, Rubber Chemical and Drugs Division, OPS. On leave as director and Midwest sales manager, Givaudan-Delawanna.

W. H. Geib. Superintendent of the Glidden Co. plant in Reading, Pa. With company since 1930, most recently as production manager at Reading. Lehigh graduate. His new assistant: **Robert Kempf.** With Glidden since 1945. Case graduate.

Lawrence W. Bass

New chairman of the committee on equipment and materials, research and development board.

Affable, soft-spoken Larry Bass—now on leave from the vice presidency of USI—is no newcomer to the group of industrialists who serve Washington in a volunteer capacity. Back in 1942 he was appointed as liaison with Quartermaster research and development by the National Defense Research Committee. He was chairman 1943-47 of the committee on Quartermaster problems of the National Research Council.

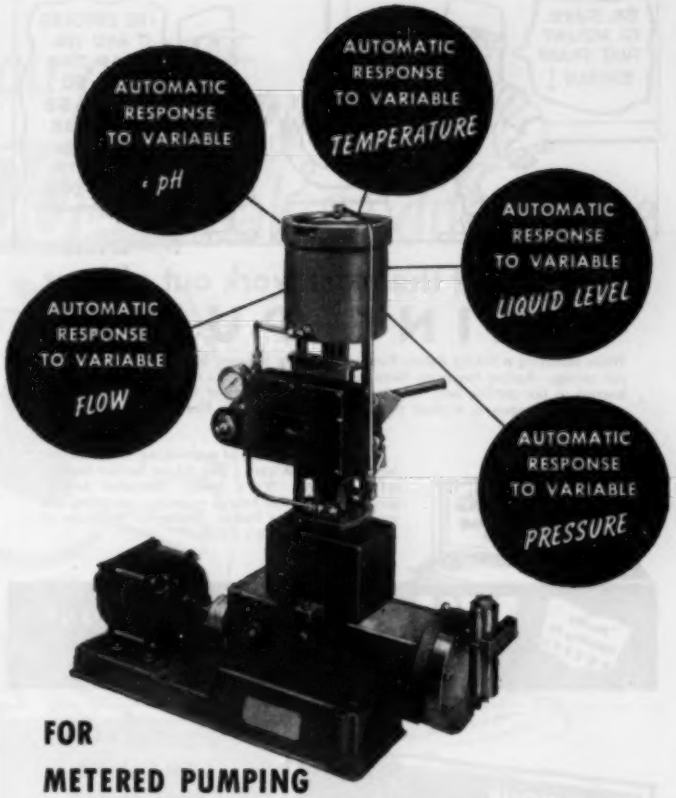
He became interested in engineering and science as a boy when a friend gave him a beautiful set of drafting instruments. The red-headed ten-year-old immediately decided to be a civil engineer—got himself a home-made plane table and a trigonometry. His enthusiasm was only slightly dampened by a comment from one of his mother's friends who noticed him laboriously copying by hand a table of sines, "The boy may be smart at figures but he can't spell!" A second year no-credit course given by an enthusiastic high school chemistry teacher for a small group of zealots decided his life work.

In 1919 he was graduated from Sheffield Scientific School at Yale; in 1922 he won his Ph.D. For the next two years he studied at the University of Lille and the Sorbonne.

He worked for the Rockefeller Institute on his return to the U.S., then Borden's. In 1937 he returned to Mellon as assistant director. In 1942 he became director of the New England Industrial Research Foundation. In 1944 he became director of chemical research, Air Reduction Co., and director of research and development, USI.

Try to pin him down to a hobby and you don't get very far. He and

(Continued)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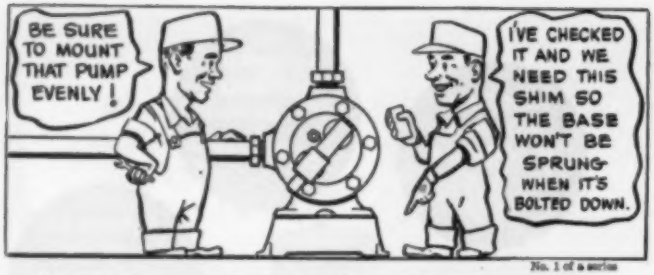

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his wife go antique hunting once in a while and are both voracious readers. Actually, his notion of a hobby seems to add up to congenial living in mid-city. This stems from a desire to be near libraries, museums, theaters, music, and good restaurants and to have a convenient center for visits from a wide circle of out-of-town friends.

John F. Corwin. Chief of the resins, plastic materials and adhesives section, chemical and drugs branch, Chemicals and Drugs Division, OPA. On loan from the chemical division, Koppers Co., Pittsburgh. Chemical director, chemical division, Borden Co., 1944-1949; with plastics division, American Cyanamid, 1943-44; previous to that, chief of resins and plastic materials division, OPA.

V. G. Bartram. President of B. A.-Shawinigan Ltd., new petrochemical company jointly owned by British American Oil Co. and Shawinigan Chemicals Ltd. Continues as president of Shawinigan Chemicals Ltd.

H. E. Cunningham. With sulphuric acid unit, chemicals division, NPA, for the duration. On loan from Tennessee Corp., Atlanta, Ga.

Clarence H. Buurman. Chief area chemist, sulphur colors and textile auxiliaries area, Grasselli Works Division, General Aniline & Film. Joined company in 1941 as a research chemist. Graduate of the State University of Iowa.

Howard K. Nason. Director of research of Monsanto's organic chemicals division. Has been assistant to the vice president in charge of research, development and patents. Came to Monsanto in 1936 as a research chemist. Progressed as: assistant director of research, plastics division; director of development then assistant director then director of the central research department. Graduate of the University of Kansas.

Bill Burns. Superintendent of Kaiser Aluminum & Chemical Corp.'s Sea Water plan at Moss Landing, Calif. Has been in charge of the Uranium Melt Plant, Hanford Works, Washington. Former Kaiser positions in the rolling mill and research departments at Trentwood.

John J. Healy, Jr. Assistant to the vice president in charge of research,

(Continued)

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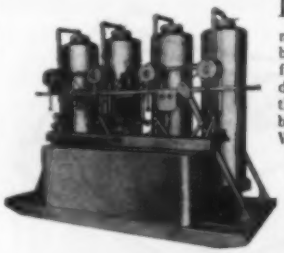

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NAMES IN THE NEWS, cont. . .

Development and patent activities, Monsato. Has been assistant general manager of the company's Merrimac Division at Everett, Mass. Division positions since 1921: research chemist; assistant in technical service; director of development. Studied at Harvard and MIT.

R. W. Sudhoff

F. Soday

R. W. Sudhoff. Associate director of development, Chemstrand Corp. Previously with Monsanto for 22 years, most recently as assistant director of research for central research laboratories. Graduate of Washington University. New director of research and development of synthetic fibers: **Frank J. Soday.** For the past four years, research and development director, Lion Oil Co. During World War II, technical director for Copolymer Corp. which operated a government synthetic rubber plant at Baton Rouge. Studied chemical engineering at Grove City College and Ohio State (Ph.D., 1932).

Harold W. Paine. Retired assistant to the director, DuPont's polychemicals department laboratory. Has devoted 36 years to plastics research, most of it in company laboratories.

Stephen S. Hubard. Manager of research, Davison Chemical Corp., Baltimore. With company since 1944. Studied at the University of Kentucky and Cornell.

Wilhelm Gruber. To perform research at Smith, Kline & French Laboratories, Philadelphia, during the next year. Has been assistant professor of organic chemistry at the Chemical Institute of the University of Vienna. Graduate of that university.

Leon L. Bertram. Assistant manager of the Virginia cellulose plant, Hercules Powder Co.; has been operating supervisor since 1950. Positions since coming to the plant in 1941: chemist, development super-

visor, chief chemist. Graduate of Penn State.

Carl F. Williams. Technical director, Vopcolene Division, Vegetable Oil Products Co., Los Angeles. Formerly a director and manager of W. C. Hardesty Co. and the Hardesty Chemical Co. operations at Dover, Ohio.

Walter H. Stanton. Project leader in the chemical engineering design group, Monsanto's Texas division. Has been in charge of one of the projects in the current Texas City expansion. Joined company as an analytical chemist in 1942. Purdue graduate.

R. L. Heider and **W. H. Lane.** Assistant research directors, Texas Division, Monsanto. Mr. Heider: joined Monsanto as a research chemist in 1941; studied chemical engineering at Northwestern; doctorate in organic chemistry, Purdue. He will be administrator of organic and physical programs. Mr. Lane: joined Monsanto in 1942 as research chemist in the plastics division; studied chemical engineering at Rice; doctorate at the Institute of Paper Chemistry, Appleton, Wis. He will be administrator of pilot plant activities in the field of applied research.

James Van Lanen. From research project supervisor to assistant research director, central research and development department, Hiram Walker & Sons. Came to Hiram Walker in 1946 from Northern Regional Research Laboratory. Graduate of the University of Wisconsin.

Alexander Averbach. Senior research chemist, Hilton-Davis. Formerly with American Aniline Products. **Ernest L. Field:** senior research and development chemist; comes from Sterling-Winthrop Research Institute. New research chemists: **Walter S. Hogue; John W. Delaney.**

Walter W. Edens. Defense projects executive, Alloy Engineering & Casting Co., Champaign, Ill. Formerly works manager and vice president, Badger Brass & Aluminum Foundry Co. New chief metallurgist: **Thomas G. McNamara,** former chief metallurgist, Continental Aviation & Engineering Corp.

Charles H. Carpenter, Jr. Senior market research analyst, new product development department, Amer-

(Continued)

Submerged Combustion

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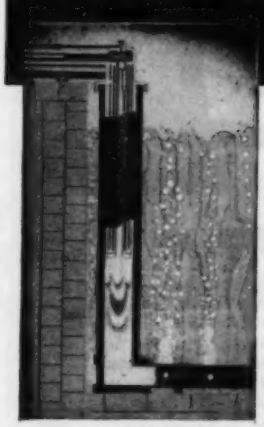

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ican Cyanamid. With U.S. Steel since 1941. Studied chemistry at West Virginia University, Bucknell and the University of Pittsburgh.

M. C. Hopkins. Technical director of Pan American Refining Corp. plant at Texas City. Has been coordinator of research and development. New associate director of research and development: **J. E. Kasch,** formerly assistant director. New director of the company's automotive research laboratory in Baltimore: **William Kaplan.** At Texas City for the past ten years as head of process design and more recently in charge of the technical service station.

M. C. Hopkins

L. C. Palmer

L. Calvin Palmer. Engineering director, Mutual Chemical Co. of America Project engineer with the company since 1945. During World War II, chief of plant design group at Edgewood Arsenal. Studied chemical engineering at Louisiana State.

Phiroze D. Shroff. Development chemist, GE's chemical department. Studied at Royal Institute of Science, University of Bombay, Michigan State College (Ph.D in chemical engineering). New research chemists: **Joseph C. Caprino,** formerly with Marion Machine Tool Co.; **Robert J. Prochaska,** formerly with Chas. Pfizer; **John M. Tome,** formerly research assistant, Penn State; **Quinton P. Cole,** formerly with American Cyanamid; **Milton Wolf,** formerly with Food Research Laboratories.

John E. McKeen. Honorary member, American Institute of Chemists. President of Chas. Pfizer & Co. since 1949.

Parker Dunn and **Thomas F. Edson.** Assistant vice presidents, American Potash & Chemical Corp. Mr. Dunn: For 10 years with Potash Co. of America, Carlsbad, N. M., most recently as resident manager.

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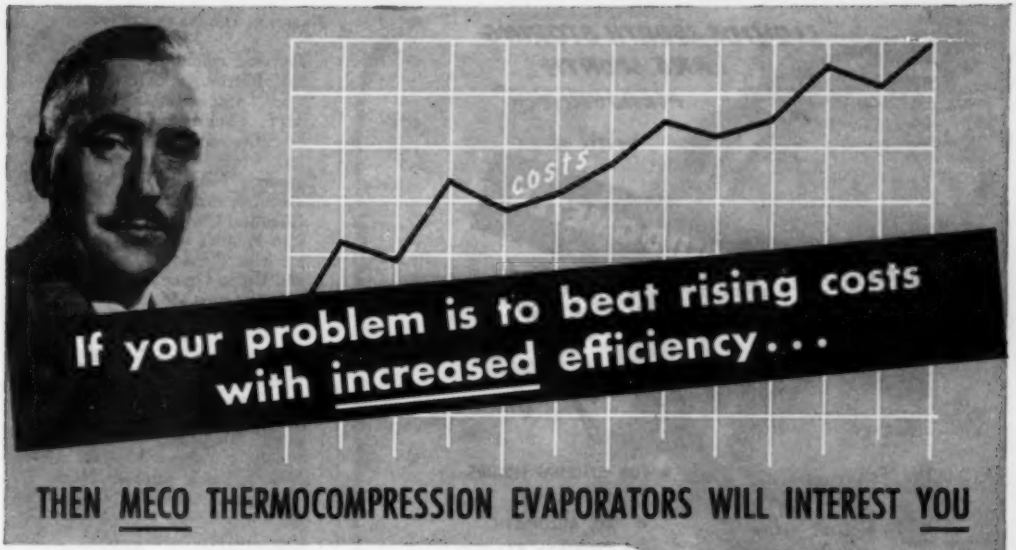

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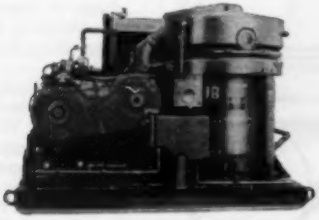

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NAMES IN THE NEWS, cont. . .

Previous employers: Southern Alkali, Pittsburgh Plate Glass, Mead Corp. Studied at Ohio State and MIT. **Thomas F. Edson:** Formerly executive assistant for Victor Chemical Works, Chicago. Earlier background: From plant engineer to executive vice president, A. R. Maas Chemical Co.; three years at American Potash's plant at Trona; service with Firestone Tire & Rubber and Union Oil companies; graduate of California Institute of Technology.

Raymond W. Meyer. Plant superintendent at the Houston plant of the Corrulux Corp. Formerly project engineer, product development laboratory, Owens-Corning Fiberglas Corp., Newark, Ohio. New technical director: **Henry C. Thompson,** formerly president of Richelieu Corp., New York.

Edward U. Condon. Director of research and development, Corning Glass Works. Since 1945, director of the National Bureau of Standards.

Philip C. Hamm. Member of Monsanto's agricultural chemicals section, organic chemicals division development department. With Monsanto's Western Division, 1944 to 1949; with Midwest Research Institute since then. Studied at the University of Minnesota.

R. W. Breidenbach. San Francisco district manager, industrial chemicals division, Commercial Solvents Corp.; has been in the company's Los Angeles office. Earlier history: graduate in chemistry, Loyola University; chemical research engineer, Lockheed Aircraft; chemist in charge of research and control of the Standard Vanilla Co.; joined Commercial Solvents, 1948.

Edward M. Epstein. Manager, quality control section, nylon division, Du Pont. With company since 1922: Technical and production posts at plants in Old Hickory, Tenn., Richmond, Va., Buenos Aires; since 1950, technical superintendent at Old Hickory. Studied chemical engineering at MIT.

Charles A. Brown. Assistant professor of chemistry, Western Reserve University. Since 1948, instructor in inorganic chemistry at Harvard. Studied at Hiram College and Cornell.

J. E. Swearingen. General manager of

production, Standard Oil Co. (Indiana) at Chicago. Has been a director and assistant to the executive vice president of Stanolind Oil and Gas Co., Tulsa, Okla. Joined Standard in 1939 as a chemical engineer in the research department at Whiting, Ind. Studied at the University of South Carolina and Carnegie Tech.

L. D. Barrick. Manager of the new fine chemicals division, Pittsburgh Coke & Chemical Co. Has been chemical director, Arnold Hoffman & Co. Has worked with Gulf Oil and General Aniline & Film as a consultant. New assistant manager: **R. M. Locke.**

L. D. Barrick

H. H. Mottern

Hugh H. Mottern. Manager, Kraft Foods Co. research laboratories. Since 1945, assistant chief research chemist then research director, H. J. Heinz Co. For 19 years previous to that, with U.S. Department of Agriculture.

Frederic V. Schossberger. Research physical chemist, Armour Research Foundation. Formerly a research chemist with Glidden Corp., Baltimore. Graduate of the Technical University, Prague, Czechoslovakia; doctorate from the University of Gottingen, Germany.

R. W. Merritt. Assistant vice president, National Starch Products. With company since 1937, most recently as coordinator of operations for the manufacturing department. Doctorate in chemical engineering, University of Michigan.

Frank M. Tiller. Director of the division of engineering of the new Lamar State College of Technology to open this month. Has been associate professor of chemical engineering, Vanderbilt University, Nashville, Tenn. since 1942. Studied at the universities of Louisville and Cincinnati.

P. C. White. Manager of research and development, Pan American Refining Corp., New York. Since 1950, director, fuels and special

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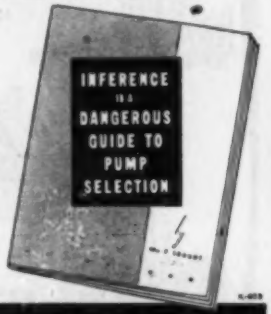

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NAMES IN THE NEWS, cont.

products division, research department Standard Oil Co. (Indiana), Whiting, Ind. Doctorate in chemistry, University of Chicago.

W. E. Elwell. Manager, eastern product division, Oronite Chemical Co. Formerly supervisor of chemical products, California Research Corp.

B. F. Daubert. Assistant manager, laboratory section, research department, Koppers Co. Since 1943, research administrator and research professor in the chemistry department, University of Pittsburgh.

B. F. Daubert

J. E. Kircher

John E. Kircher. Manager, petrochemical department, Continental Oil Co. Associated with Sharples Chemicals, 1943 to 1950, in research and development work; for the past eight months, director of development, Stephan Chemical Co., Chicago. Studied at Culver-Stockton College and the University of Missouri (Ph.D. in chemistry).

Charles F. Eck. Assistant director of process engineering, Texas Division, Monsanto. Formerly a project leader in the process engineering department. Joined Monsanto in 1941 as a pilot plant supervisor, central research department, Dayton, Ohio. Studied chemical engineering at the University of Wisconsin and VPI.

E. Madison Jones. Project leader, process investigation, Monsanto's Texas City plant. Joined Monsanto in 1946 as an analytical chemist. Studied chemical engineering at the universities of Texas and Michigan. New project leader in the chemical engineering design group: **James R. Fair, Jr.** Joined Monsanto as a laboratory chemist in 1943. Studied at Georgia Tech and the University of Michigan.

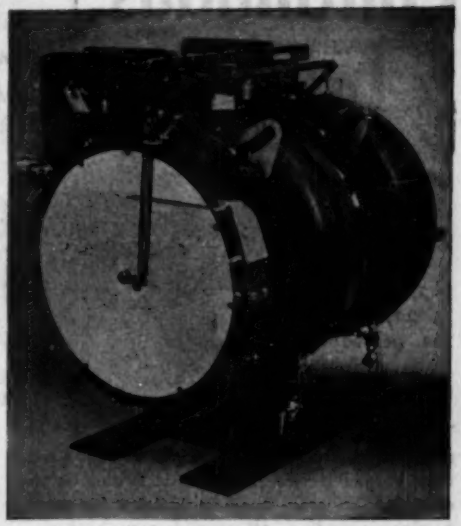
Karl Folkers and Max Tishler. Associate directors of the research and development division, Merck & Co. Dr. Folkers: Joined Merck in

(Continued)

Full scale operation

from a differential of

one inch of water



Hagan Ring Balance Dual Meter, with two low differential rings.

In Hagan Ring Balance Meters the torque resulting from a given differential can be made high by using a ring with large cross-sectional area. Friction is low because of the knife-edge bearing on which the ring is mounted. The high torque-to-friction ratio thus obtained permits full scale operation with a differential as low as *one inch* of water.

Other Hagan Ring Balance Meters—all standard models—are available for maximum differentials up to 420 inches water column. In the 20 to 140-inch differential range, standard meters can be supplied for static pressures up to 15,000 psig.

Every Hagan Ring Balance Meter has these four major features:

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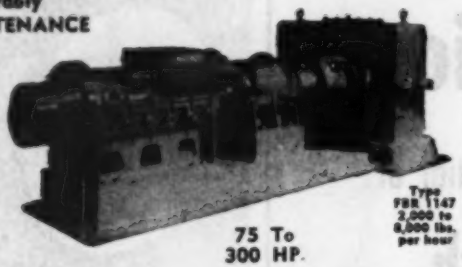

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1. A portable independent economical unit for permanent or temporary service, quickly placed in operation at any work height.
2. Avoids oxidation or reprecipitation of reagent due to agitation—operates on siphon principle.
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NAMES IN THE NEWS, *cont. . .*

1934; assistant director of research, 1938; director of the department of organic and biochemical research, 1945. Dr. Tishler: Joined Merck as a senior chemist, 1937; section head in charge of process development, 1941; director of the department of developmental research, 1944.

Manson Benedict. Technical assistant to the general manager to organize an operations analysis staff for the AEC. On leave as professor of nuclear engineering, MIT. Earlier history: Cornell graduate, doctorate in physical chemistry from MIT; research chemist with M. W. Kellogg; head of process development for Kellex Corp.; director of process development for Hydrocarbon Research. Winner in 1947, William H. Walker award of AIChE.

Charles L. Kepley. Chemical field engineer, A & P Finishing and Mfg. Co., Melvindale, Mich. Formerly: assistant supervisor in the air-dry synthetic enamel division, Ditzler Color Co.; chief in charge of control laboratories and manager of glycerine and phthalic anhydride plants, Reichhold Chemicals. Studied at Ball State College and Indiana and Wayne Universities.

George E. Symons. To establish an independent consulting service in Larchmont, N. Y., on plant and laboratory design, research and operation problems in the field of water, sewage, and industrial waste treatment. Formerly, managing editor, Water & Sewage Works.

OBITUARIES

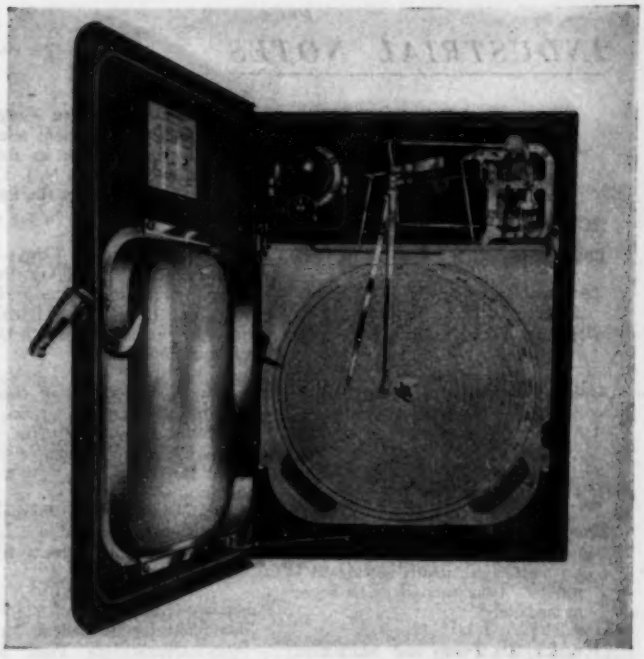
Alan Porter Lee, 61, president of Alan Porter Lee, Inc., consulting chemical engineers of New York, died at his home in Morristown, N. J., August 9.

Wilbur Judson, 71, senior vice president and a director of Texas Gulf Sulpher Co., died in New York, August 9. He had been with Texas Gulf since 1921.

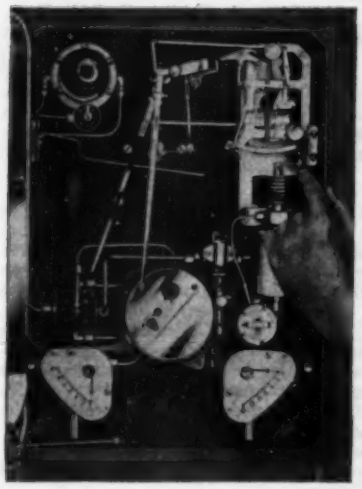
James F. Couch, 63, chemist with the U.S. Department of Agriculture's Eastern Regional Research Laboratory, in Wyndmoor, Philadelphia, died in Philadelphia August 9.

E. E. Ware, 71, special assistant to the president of Sherwin-Williams, died July 8. He had been with the company since 1912.

Anybody Can Take Care of a BRISTOL SERIES 500 CONTROLLER



Plant operating men quickly become familiar with it... and like to use it



Only One Simple Adjustment

Write or call your local Bristol representative. And write for Bulletin A120. THE BRISTOL COMPANY, 113 Bristol Road, Waterbury 20, Conn.

BRISTOL

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

INDUSTRIAL NOTES

NEW FACILITIES

Continental Carbon Co.—A laboratory in Amarillo, Tex., for research on channel blacks, furnace blacks and oil blacks.

Gulf Naval Stores, Gulfport, Miss.—A $1.7 million plant at Andalusia, Ala., for production of turpentine, resin, etc., from long leaf pine stumps. It will be completed in about nine months.

Dow Chemical Co.—Research laboratories at its Midland, Mich., and Freeport, Tex., plants costing $4.5 million. Construction is to begin immediately.

Worthington Pump and Machinery Corp., Harrison, N. J.—A branch office in Harrisburg, Pa., headed by A. L. Mays.

Courtaulds, Ltd., London—A plant in Mobile, Ala., to produce rayon staple by the viscose process, to be operated by a subsidiary, Courtaulds (Alabama) Inc. Initial production, scheduled for early 1953, will be 50 million pounds per year.

Pennsylvania Salt Mfg. Co.—A district sales office in Dallas for its chemical products. The office will serve Texas and Oklahoma.

Republic Flow Meters Co., Chicago—A Seattle district office headed by Henry Weber.

California Spray-Chemical Corp.—A plant at Decatur, Ala., for insecticides, fungicides and weed killers. C. M. Crutchfield is manager.

U. S. Rubber Co.—The reactivated Kankakee Ordnance Works, Joliet, Ill., which manufactured high explosives during World War II.

Applied Research Laboratories—A plant for its Quantometer Instrument Division in Glendale, Calif.

Witco Chemical Co., New York—A wing on its Chicago laboratories to permit increased research on organic chemicals.

Allied Chemical & Dye Corp.—A $500,000 new applications research laboratory building for its Barrett Division in Edgewater, N. J. Completion is scheduled for the first of the year.

Allied Chemical & Dye Corp.—Pilot plant facilities, $350,000 worth, for its Solvay Process Division in Hopewell, Va., for work on fertilizers, nitrogen products and synthetic organic chemicals.

Eli Lilly & Co.—Increased capacity for manufacturing penicillin and streptomycin at Lafayette, Ind. The project should be completed in about two years.

Sharples Chemicals Inc., Philadelphia—A unit, just completed, which substantially increases capacity for alkylamine production.

American Cyanamid Co.—A $3 million plant for its Lederle Laboratories Division in Pearl River, N. Y., for the manufacture of pharmaceuticals.

Abbott Laboratories, North Chicago, Ill.—A unit in Oak Ridge, Tenn., for the exclusive production of radioactive isotopes for medical diagnosis and therapy.

Reeves Pulley Co., Columbus, Ind.—A manufacturing, sales and engineering branch in San Francisco. R. G. Sullivan will be in charge of West Coast operations.

Celanese Corp. of America—A $500,000 main laboratory building at its Clarkwood, Tex., petroleum chemical research and development center which will be in operation within the year.

Stone & Webster Engineering Corp.—Badger Process Division to carry on the activities formerly engaged in by E. B. Badger & Sons Co. and Stone & Webster's own process division. E. B. Badger, formerly president of E. B. Badger & Sons, has been elected a director of Stone & Webster. Ralph D. Waterman, former vice president of the Badger company, has become a vice president of Stone & Webster.

Dynakon Corp., Cleveland, to produce laminated and molded glass-reinforced plastics. President: Harry Raech, Jr.

Tennessee Eastman Co.—A tank farm (including tank car unloading facilities pictured above) for handling acetic acid, solvents and plasticizers at its distribution center at Lodi, N. J. Also, warehouse space has been doubled.

Pittsburgh Coke & Chemical Co.—First major unit of its new central research laboratories at Neville Island near Pittsburgh, Pa., which doubles its available laboratory space. Neville Island is also the site of production facilities which are under construction for the company's new fine chemicals division.

Heyden Chemical Corp.—A series of new laboratory units at its chemical research division, Garfield, N. J., which will constitute a 30 percent expansion there.

Mathematical Computing Service, Brooklyn, N. Y., to specialize in the construction of complex nomographs requested by chemical engineers and others in many industries.

C. P. Steuber & Co., New York, to handle foreign sales for American producers of chemicals and related products and to act as American purchasing and sales representative for a number of foreign companies. Charles P. Steuber, the company's founder, spent several years traveling in Europe as manager of the chemicals division of the Union Carbide and Carbon foreign sales subsidiary.

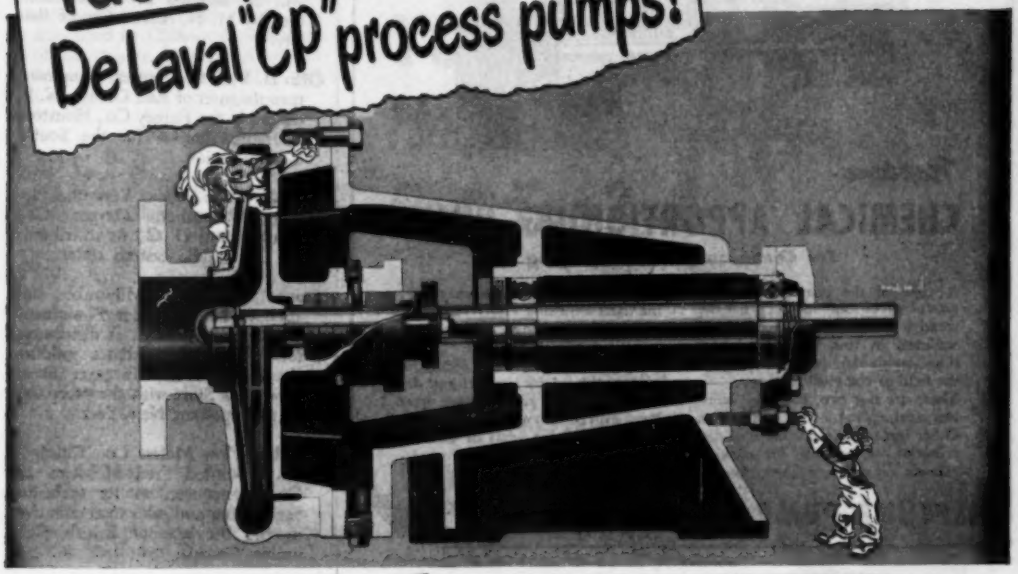
NEW REPRESENTATIVES

Metals Disintegrating Co., Elizabeth, N. J., manufacturers of metal pigments, powders and abrasives, has appointed Roy A. Ribelin Distributing Co., Houston, its distributor in southeastern Texas.

Conoflow Corp., Philadelphia, has

(Continued)

Facts you should know about De Laval "CP" process pumps!



We put eductor vanes on the back of open impellers!

Why? Because the eductor vanes develop higher pressures than the pumping vanes. This reduces end thrust, relieves stuffing box pressure, keeps the back of the impeller clean and prevents binding . . . all important points that insure better operation and less maintenance.

NOW! You can adjust a pump for wear without opening it up!

How? It's easy if you have a De Laval CP pump. The secret is in the tapered wearing ring. This means you don't have to replace the wearing ring to restore the pump to its original efficiency. All you do is turn this external adjusting screw. This moves the entire rotor and impeller forward and permits you to adjust for proper clearance between the case and wearing ring . . . *it's as simple as that.*

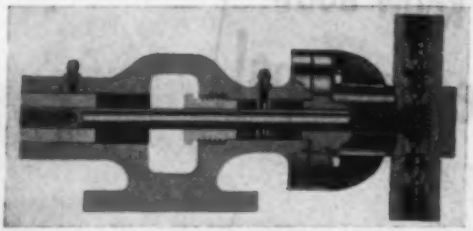
DE LAVAL STEAM TURBINE CO., TRENTON 2, N. J.

TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS

50th DE LAVAL Anniversary

CPP-8

Here . . the "INSIDE STORY"



Neptune

CHEMICAL APPORTIONING PUMP

For Continuous Chemical Feeding

A view of the components — the *vitals*—gives some idea of what the creative Neptune engineers have achieved in this modern, streamlined pump that is outstanding in the field of chemical feeding.
There are not two, but *four* stainless steel, spring-loaded ball valves. Other features provide for even distribution of pressure for packing take-up . . . constant lubrication . . . simplified packing replacement . . . the "self-adjusting" universal joint . . . an extra-strong cast iron base for the complete assembly.
Above all, the Neptune Pump is noteworthy for its *simplicity of design* and *fewer parts*. Severe tests have proved its ruggedness . . . its readiness to give years of uninterrupted service without costly servicing and production delays.

NEPTUNE PUMP MFG. CO. 4912 N. 6th Street Philadelphia 20, Pa.

CHEMICAL MACHINERY

ILLUSTRATION:
A ten foot high all stainless steel slurry washer built for a Pharmaceutical plant.

MULTI-METAL skilled craftsmen specialize in fabricating complete custom tailored processing equipment and semi-apparatus. Also complex sheet metal assemblies which may or may not require wire or filter cloth. Our Engineering Staff is at the service of our customers, helping to solve design and production problems. Send your prints and specifications for prompt quotations.

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INDUSTRIAL NOTES, cont. . .

appointed Harold G. Jones Co., Pittsburgh, its representative in western Pennsylvania and West Virginia. Sales of Conoflow's pneumatic control accessory equipment will be handled in the Houston area by M. N. Aitken Co. of that city.

Otto H. York Co., process equipment manufacturer of East Orange, N. J., has made the Rainey Co., Houston, its representatives for the South-Central region.

Tempilo Corp., New York, has appointed Southern Oxygen Co., Washington, D. C., its distributor for the middle eastern states.

Ampco Metal, Inc., Milwaukee, has appointed R. J. Greer Equipment Co., Syracuse, N. Y., as distributor for its line of resistance welding electrodes. Greer will cover all of New York State with the exception of metropolitan New York.

Republic Flow Meters Co., Chicago, has appointed Fred McMeans & Co., Vancouver, as its exclusive engineering and sales representative in the Province of British Columbia, Canada.

NEW NAMES

Kellex Corp., New York, specialist research and engineering firm, has changed its name to Vitro Corp. of America.

Lyon-Raymond Corp., Greene, N. Y., manufacturers of materials handling equipment, has changed its name to the Raymond Corp.

NEW LINES

Bristol Laboratories Inc.—Streptomycin, to be produced as soon as the necessary fermentation and extraction facilities can be installed at the company's Syracuse, N. Y., plant now producing penicillin.

National Lead Co., New York—Specialized refractory materials through the acquisition of Charles Taylor Sons Co. which has plants in Cincinnati and in Taylor, Ky.

Diamond Alkali Co., Cleveland—DDT and benzene hexachloride through the acquisition of Kolker Chemical Works, Inc., Newark, N. J.

Trinity Equipment Corp., Roselle Park, N. J.—Dehumidifiers and air

drying equipment through the purchase of Industrol Corp., Brooklyn, N. Y.

Dewey & Almy Chemical Co., Cambridge, Mass.—A British type battery separator to be turned out at its new plant near Boston. The separator, trade-named Fibrak, was developed by Oldham & Sons Ltd. of Manchester. Dewey & Almy will be sole distributor in the U.S. and Canada.

NEW LOCATIONS

Rietz Mfg. Co., manufacturer of equipment for the food and chemical processing industries, has moved its main office and plant to 150 Todd Rd., Santa Rosa, Calif.

Griscom-Russell Co. has moved its general offices to Massillon, Ohio, where its plant for manufacturing heat transfer apparatus is located. The company will continue to maintain a sales office in New York.

Neumann-Buslee & Wolfe, Inc., Chicago manufacturer of flavors, perfume compounds and related essential oil products, has moved to 5800 Northwest Highway.

Perry Equipment Corp., maker of stainless steel tanks, has moved to 1421 North Sixth St., Philadelphia.

Seybold Co. is moving its chemical division from its main Cleveland plant to 5308 Blanche Ave. The division makes litho-chemicals.

Dow Corning Corp., New York, has moved to 600 Fifth Ave.

Deep Rock Oil Corp. has moved its general sales office to Tulsa, Okla.

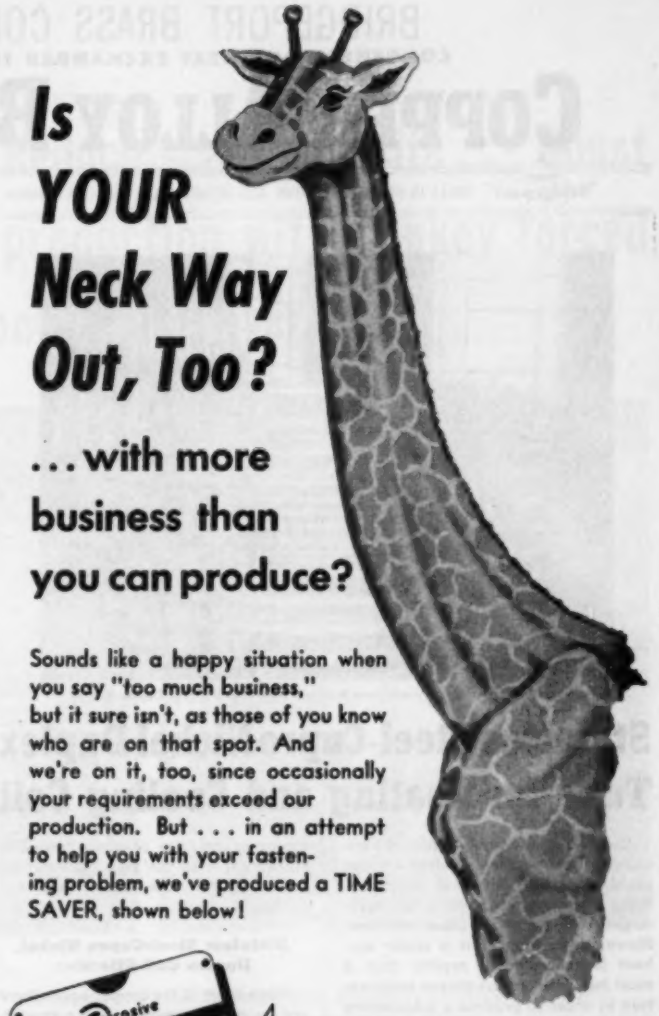
Reichhold Chemicals, Inc., has moved its export division to 630 Fifth Ave., New York. Executive offices have also been opened there.

Hinson & Vancil, creators, managers, of trade shows and expositions, have moved to 19 South La Salle St., Chicago.

Babcock & Wilcox Tube Co., Beaver Falls, Pa., has moved its Pacific Coast sales office to 111 Wilshire Blvd., Los Angeles.

Petro-Chem Development Co., engineers and erectors of furnaces and superheaters, will move to 122 East 42nd St., New York, in November.

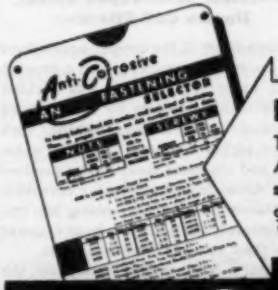
—End



Is YOUR Neck Way Out, Too?

... with more business than you can produce?

Sounds like a happy situation when you say "too much business," but it sure isn't, as those of you know who are on that spot. And we're on it, too, since occasionally your requirements exceed our production. But . . . in an attempt to help you with your fastening problem, we've produced a TIME SAVER, shown below!



FREE—A-N Stainless Fastening Selector

This handy slide-chart instantly identifies A-N Nos. pertaining to stainless steel nuts, screws, bolts, rivets, cotter pins, washers; gives sizes and other data. Write for "Chart 51D" TODAY!

Anti-Corrosive Metal Products Co., Inc.

Manufacturers of STAINLESS STEEL FASTENINGS

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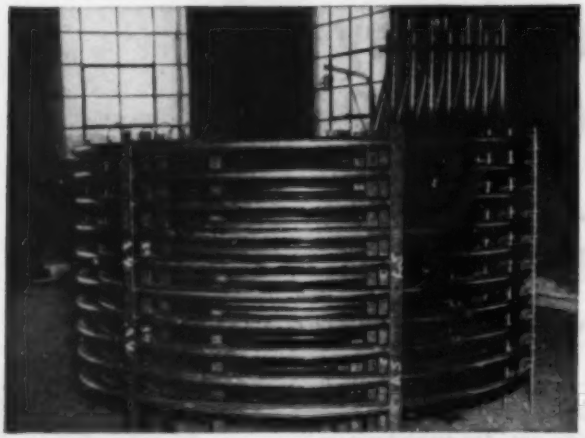
BRIDGEPORT BRASS COMPANY
CONDENSER AND HEAT EXCHANGER TUBE EDITION

COPPER ALLOY BULLETIN

"Bridgeport" MILLS IN BRIDGEPORT, CONN. AND INDIANAPOLIS, IND.—IN CANADA: NORANDA COPPER AND BRASS LIMITED, MONTREAL



Heating and cooling coil made from Stainless Steel-Cupro Nickel Duplex Tubing

Stainless Steel-Cupro Nickel Duplex Tube for Heating and Cooling Coil

Controlling the temperature of various chemical reactions is often a major problem in the chemical industries. Some heating is required in the early stages to help activate these reactions. However, as soon as it is under way heat is generated so rapidly that it must be cooled to the proper temperature in order to produce a satisfactory product and prevent decomposition of materials. In addition, the presence of various acids in the solution is often too corrosive for ordinary materials.

Stainless Steel Coil Failed

The coil illustrated above was originally constructed from stainless steel tubing 2¼" O.D. x .218" wall thickness. Ordinarily, stainless steel would have been a suitable material of construction in the particular chemical service involved.

On the other hand, although stainless is highly resistant to many corrosive elements, it is vulnerable to stress corrosion cracking, particularly in the presence of chlorides. Failures were encountered in the stainless coil primarily from the inside surface of the tubing in the form of stress corrosion cracking due to the high chloride ion found in the raw water used for cooling.

Stainless Steel-Cupro Nickel Duplex Coil Effective

Since most of the copper-base alloys are resistant to cracking and corrosion from water and brine, it was decided to solve this problem by constructing the coil from Duplex tubing with cupro nickel to the circulating water side and stainless steel to the product side. Aside from its superior corrosion resistance the Duplex tubing has approximately 25% higher heat transfer rate than straight stainless steel.

From a construction standpoint, the coil is more difficult to fabricate than the straight stainless type. To obtain the required fast cooling rate, a large surface area must be presented to the liquid to be cooled. Furthermore, a rapid change in circulating water must be effected. Consequently, this special coil was designed with seven separate coils nesting together. The outer coil is approximately 8 ft. in diameter and is made from 262 ft. of tubing. The inside coil, which is the smallest, is approximately 3 ft. in diameter and made from 158 ft. of tubing. The Duplex tubing used for the construction of this coil was 2¼" O.D. and both the outside stainless steel component and the inside cupro nickel component had a wall thickness of 0.109".

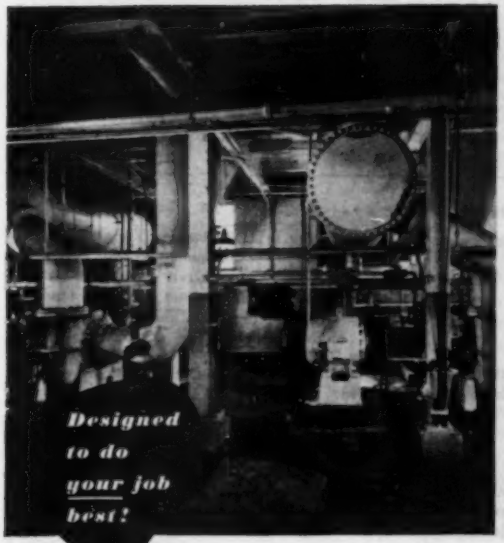
Joining Duplex Tubing by Heliarc Welding

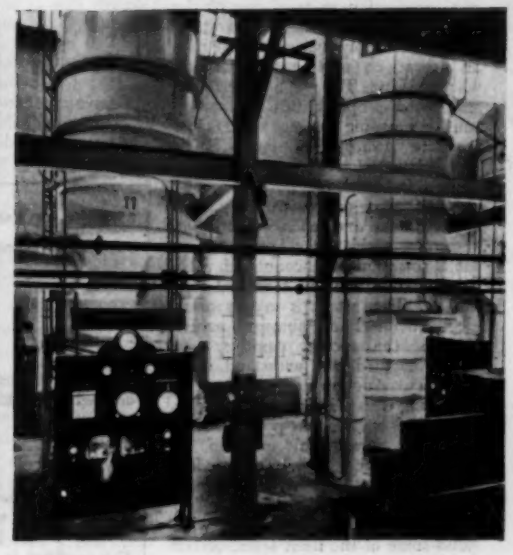
An ingenious method was used to join the 24 ft. lengths of Duplex tube to make the continuous length required for each of the coils. To protect the cupro nickel from the corrosive products, it was necessary to join stainless steel to stainless steel and cupro nickel to cupro nickel. To prevent contamination of the stainless weld with copper, a special low-carbon content Type 304 stainless tubing was used for the outside component of the Duplex combination. First, the outside layer of stainless steel at the ends to be joined, was cut back approximately ½". Then the cupro nickel ends of the two tubes were butted and welded with a special welding rod by the heliarc welding process. Then the outside layer of stainless steel was built up by heliarc welding.

The above represents an extreme case of construction involving the welding of Duplex tubing into long lengths, coiling, etc. Most applications for Duplex tubing require straight lengths that can generally be fitted into the headers of condensers and heat exchangers similar to single wall tubing. Unless conditions are exceptionally severe, requiring cupro nickel for example, most applications may use copper, Admiralty, brass or aluminum bronze towards the circulating water side. The increasing use of Duplex tubing in an ever widening list of applications attests its superiority over single wall tubing for solving difficult corrosive conditions and for reducing costly maintenance. (7153)

See
General American for
CREATIVE EVAPORATOR ENGINEERING

Reduce scale deposits . . . Boost production with Conkey forced circulation horizontal tube evaporators





Liquids that tend to "scale up" need not push down your production. The Conkey forced circulation horizontal tube evaporator circulates large volumes of liquid at high velocities—through submerged and flooded tubes. In many cases, this scrubbing action is sufficient to greatly retard coating of tubes, even eliminating the scaling problem entirely.

Top production with top economies are assured by Conkey's unique design. A far smaller heating surface is required because of the high heat transfer coefficients obtained by forced circulation.

Whatever your special concentration problem may be, consult General American. Each installation is designed, engineered and built to fit your specific needs. Evaporators are built in a wide range of weldable metals. When required, special metals to resist corrosion, erosion and contamination can be furnished. Get technical bulletin on evaporators for your files.

Other General American Equipment:
Turbo-Mixers, Dewaterers, Filters, Dryers, Towers, Tanks, Bins, Pressure Vessels

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General Offices: 135 S. LaSalle St., Chicago 90, Ill.
In Canada: Canadian Locomotive Company, Ltd., Kingston, Ont.

Help Your Steel to Hold Its Protective Coating

It's the bonding of paint to metal that licks corrosion. Good surface preparation does the trick.

A. J. Liebman

Purchasing agents have named steel production units as one of the five most-wanted-hardest-to-get items in today's supply picture. That puts an accent on making the most of what you have. The graph on page 328 shows how proper surface preparation can help organic coatings stand up to corrosive atmospheres longer. The text below will tell you how you can apply this knowledge.

With every progressive step made by engineers and scientists in their respective fields, new problems in metal corrosion are encountered, problems unknown to our technical forefathers. This attack is mainly of an electrochemical or abrasive nature. Few of the ancient paint systems were designed to withstand such severities. Another factor is the ever increasing demand for greater production. This means that paint also has to keep pace with this speed-up. A lot of credit must be given our modern paint chemists who have kept up with the industry's demand developing paint formulations that will withstand some of the most severe service conditions.

BONDING TO METAL

Along with this progress came another problem. The ever increasing number of new paints also produced new characteristics in paints that demanded a more precise foundation or contact with the metal. This contact condition is often more important than the paint itself. That is to say, a variance in formulation can be broader in most cases than the variance of tolerance on a surface condition. Because of the inability to provide for a specific surface value, many a machine or metal structure corroded years before the selected paint had outlived its useful formulation life.

STEEL SURFACE CHARACTERISTICS

When steel comes out of a hot rolling mill, its surface is covered with mill scale. Mill scale is a layer-like structure of oxides, generally an outside layer of Fe_2O_3 (iron oxide), a slightly heavier layer of Fe_3O_4 (metallic oxide), and an inner layer of FeO (ferrous oxide).[1]

For the purpose of good paint adhesion, it is desirable to have all mill scale removed from the steel before applying paint. Mill scale is cathodic and steel is anodic. So when we introduce an electrolyte, we are forming a galvanic cell which will cause corrosion. The severity of corrosion is accelerated in those areas where patches of mill scale have been removed either at the mill or during fabrication, and the exposed metal must suffer the full galvanic impact of the larger cathode surrounding a small anode.[2]

FIRST, GET RID OF MILL SCALE

It has been said that if the steel industry would develop a steel with more ductile and tightly adhering mill scale, most of our corrosion and painting problems would disappear. I do not agree with this. Scale offers a very poor foundation for paints with medium to high surface tension such

(Continued)

If This Is Your Surface . . .	Protect It This Way . . .
Stratified rust formation on steel.	Don't paint over it. Even if a paint could be recommended, the moisture content of such rust would soon set up an osmotic pressure and thus force a coating to separate the stratified material and the paint from steel.
Heavy rust formation, generally found on steel from which scale was removed by weathering.	Remove as much of the loose rust as is possible with the equipment available. Paint must possess high wetting depth in long wetting time, low surface tension, and high adhesion.
Light rust formation, generally found after a few hours to several days exposure of steel in an industrial atmosphere. This condition is more predominant on scale-free steel than where mill scale is still present.	Brush or wipe off as much of the rust as is possible with the equipment available. Paint must possess high wetting depth in medium wetting time, low and medium surface tension, and high adhesion characteristics.
Surface covered with tight mill scale.	Paint: Medium wetting depth; medium to low wetting time; low to medium surface tension and high adhesion characteristics.
Cold rolled, untreated steel.	Paint: Medium to low wetting depth; medium to low wetting time; low to medium surface tension, and high adhesion.
Blast cleaned, pickled, ground, or machined steel.	Paint: Medium to low wetting depth; medium to low wetting time; medium to high surface tension; low to medium adhesion, and high bonding characteristics.
Clean steel surface which was chemically reacted and possesses a very dense mechanical and molecular anchor.	Paint: Low, medium, and high wetting depth; low medium and high wetting time; low medium, and high surface tension; low medium, adhesion, and medium and high bonding qualities.

New Technical Data on Sulphuric Acid-Resisting *Carpenter* Stainless No. 20

Where increased production to meet defense needs can be secured by getting *longer equipment life*, this new book about Carpenter Stainless No. 20 can help you.

It contains much data on No. 20's resistance to corrodents such as sulphuric acid, plating and pickling solutions, acetic acid, etc., etc. Information on physical constants, mechanical properties, workability and coefficient of expansion is also included. Field reports from users of No. 20 show how it has stood up in actual service, under a wide variety of corrosive conditions.

For your copy of the new Carpenter Stainless No. 20 book, just drop us a note on your company letterhead.

THE CARPENTER STEEL COMPANY, 127 W. Bern Street, Reading, Pa.

Export Department: The Carpenter Steel Company, Reading, Pa.—"CARSTEELCO"

Carpenter

STAINLESS NO. 20

Licensed under patents of The Durbrin Co., Inc.

AEROTURN
DUST COLLECTORS

FIRST! with

SELF-ADJUSTING
BLOW RINGS

A MAJOR ADVANCE IN DUST COLLECTOR DESIGN

AEROTURN engineers have developed blow rings for the Aeroturn bag-type collector which are both self-adjusting and self-aligning.

EACH FELT FILTER BAG in the Aeroturn collector is circled by a blow ring which travels up and down the bag, flexing it slightly and directing a hi-pressure reverse-air-jet into the bag from all sides to dislodge the accumulated dust from the filtering process.

THE SELF-ADJUSTING BLOW RING, exclusive with Aeroturn, is made in two half-sections which automatically conform to the bag's diameter. The entire blow ring assembly is so mounted that it floats laterally to compensate for any vertical misalignment of the felt filtering bag. These features eliminate unnecessary chafing or wear in concentrated areas along the filter bag.

The AEROTURN COLLECTOR is a compact efficient dust filter requiring only ⅓ to ⅕ the area needed by other dust filters of equivalent capacity.

Bulletin No. 501 on Aeroturn Collectors will be sent on request.

TURNER & HAWS ENGINEERING CO., INC.
100 SIMBROCO ST. BOSTON 32, MASS.

QED, cont. . .

as the modern synthetic and plastic paints exhibit. Present environments demand high surface tension, high density paints. Besides this, another of the many arguments for removing mill scale is that adhesion to scale is lower than adhesion to steel.

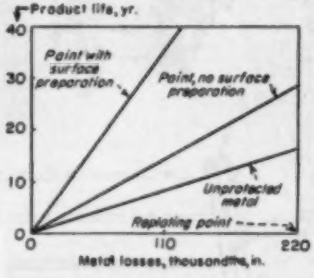
Not only must the mill scale and corrosion products be removed with the most economical methods, but the final result and its effect on the coating must be planned to a precision-like degree. The clean surface produced by any system is no longer smooth. On it, abrasion or controlled chemical attack forms a uniform pattern of peaks and valleys, the general dimension of which must be held below a predetermined height and should be uniform.

BLAST PATTERNS

During a pickling, grinding, or machining operation, this general uniformity is more easily obtained than is possible by blasting. The blast particle size, its hardness and particle velocity, influence the ultimate shape and depth of the pattern. The amount of paint that must be applied to a surface greatly determines the depth of the surface anchor. At no time must the anchor depth exceed one-third that of the total paint film thickness to be applied. If the job calls for 6 mils of paint, the anchor depth should not exceed 2 mils, otherwise, the porosity pattern of paint above the anchor peak will permit excessive moisture and chemical permeation to the metal, thus increasing the chances of an early coating breakdown.*

A comparatively uniform anchor pattern is important in view of the fact that with each deep pit we also change the stressing of the specific

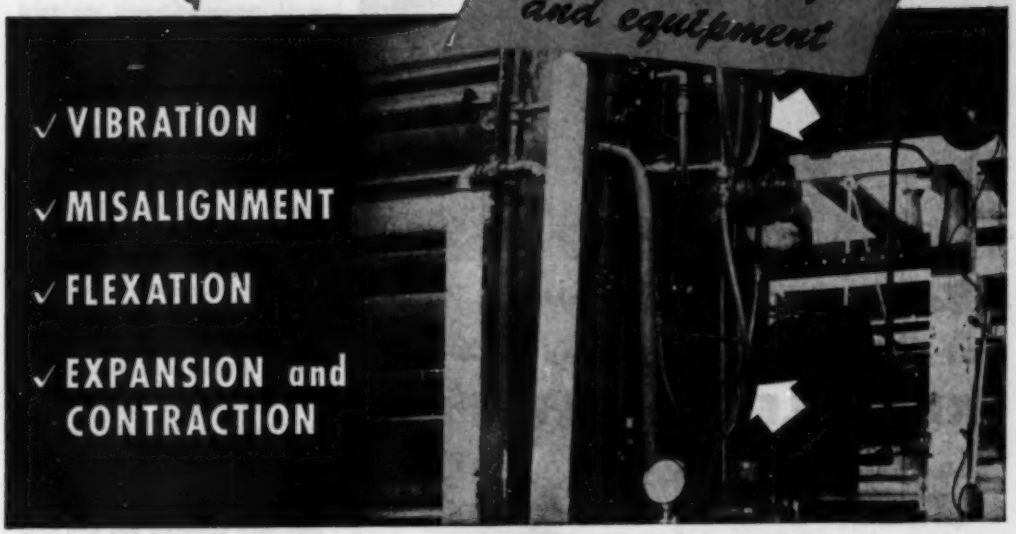
(Continued)

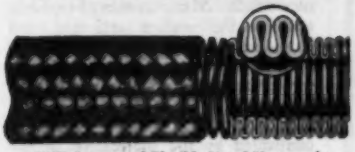


VALUE of the best protection is demonstrated by above chart showing corrosion attack on ½-in. hull side plates of coal barges at high-low water level operating in Monongahela River. Bottom diagonal indicates maximum life of unprotected metal.

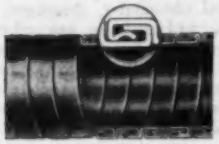
Keep these *Dangerous* stresses

out of piping and equipment





CMH Corrugated Flexible Metal Hose can be furnished in steel, bronze, stainless steel and other alloys. Depending on size, type and material, pressures up to 12,000 psi (burst) and temperatures up to 1600° F. can be handled.



CMH Convoluted Metal Hose is made in a variety of types and in steel, bronze and alloys. Depending on size, type and material, pressures up to 500 psi and temperatures up to 600° F. can be handled.

with CMH Flexible Metal Hose

MOTION or misalignment in rigid piping presents serious problems to the plant engineer. Piping subject to these stresses is in a potentially dangerous condition. In most cases these problems can be economically, dependably and safely solved by using CMH Flexible Metal Hose.

As a manufacturer of a complete line of flexible metal hose, CMH can furnish the type of hose best suited to your needs. CMH distributors are located in principal cities. See your classified telephone directory or write for his name. If you would like to have literature describing the CMH line, write for it, mentioning the types of connection problems you have.

Flexon identifies CMH products that have served industry for over 49 years.

CHICAGO METAL HOSE Corporation

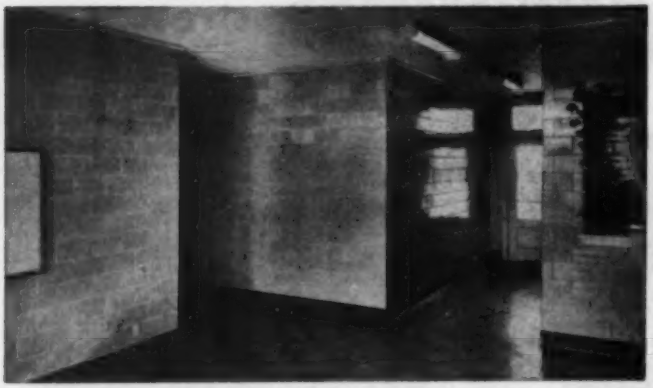
1317 S. Third Ave. • Maywood, Ill. • Plants at Maywood, Elgin, Rock Falls, and Savanna, Ill.
In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ont.

CMH

ONE DEPENDABLE SOURCE
for every flexible metal hose requirement

Convoluted and Corrugated Flexible Metal Hose in a Variety of Metals • Expansion Joints for Piping Systems
Stainless Steel and Bronze Bellows • Flexible Metal Conduit and Armor • Assemblies of Hose Components

Lobby walls of KRAFTILE at the Aluminum Co. of America offices (Reconstruction Finance Corporation plant) Riverbank, California



Now—CUSTOM-MADE Walls
at STOCK-MODEL Prices *with*
KRAFTILE Industrial Wall Units

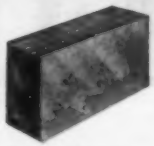
Need a wall finish that meets any or all of these special requirements?

1. Never requires painting
2. Sanitary, easy to keep clean and sterile
3. High resistance to scuffing, marring
4. Provides high light reflection
5. Impervious to water, liquids, fumes
6. Retains its original color and lustre for the life of the structure
7. Acid or alkali-resistant

You can get it with KRAFTILE glazed industrial wall units. In fact, you solve two problems at once—selection of the structural wall material and of the finish—when you specify KRAFTILE.

These glazed "building blocks" are serving Western business and industry in washrooms, laboratories, processing rooms, corridors and offices.

It will pay you to investigate KRAFTILE before you build or remodel...the attached coupon will bring complete information, promptly.



THIS IS A GLAZED STRUCTURAL WALL UNIT—a structural clay tile with a fired-on glazed surface on one or both sides. Available in clear glaze or in attractive colors...a "pre-finished" wall material with these important advantages:

★ **ONE-CRAFT INSTALLATION**—when the mason lays it up, the wall's finished—no lathing, plastering, painting!

★ **LIFETIME ATTRACTIVENESS**—never needs painting, can't fade, highly resistant to scratching and scarring. Pencil, crayon, lipstick, grease marks wipe off easily. Unaffected by water, steam, most acids, alkalis.

★ **DESIGNED FOR SIMPLE ERECTION**—wide range of shapes in modular dimensions permits fast installation with minimum of cutting and fitting on the job.

★ **PERMITS STEEL-SAVING REINFORCED MASONRY CONSTRUCTION**—approved installation methods and reinforced masonry will meet earthquake code requirements, use less steel than reinforced concrete!

KRAFTILE CO., Niles, California

( ) *Send my copy of your "Graphic Standards for Glazed Tile"*
( ) *Have your representative call*

Name_____
Company_____
Address_____
City_____ State_____
CE

QED, cont. . .

region. Non-uniform surface stresses are poorer permanent anchor stations for paint than the uniformly stressed areas. With each pit that is caused by an oversized blast particle, we also form an oversize peak. This localized metal protrusion upsets the paint thickness-surface anchor ratio. It will receive less coating coverage, thus inviting an early breakdown of the paint followed by subsequent damage to the underlying steel.

The preparation of a surface with any one of the foregoing methods not only removes the undesirable products from the surface, but increases from two to ten times the total area exposed to a more perfect contact with the paint. When this is interpreted in terms of molecular attraction, one can visualize a considerable improvement in the holding force between metal and paint. The anchor profile also permits a coating cushion between anchor stations which is mainly intended for increased holding area.

A clean surface as described so far is important to good paint performance, but it is not the maximum of surface anchor that can be obtained. During the past decade, a series of chemical surface activating treatments have been developed and used quite successfully. Many contain phosphoric acid as the surface activator, and chromates or phosphates, as a surface inhibitive agent. These treatments convert the metal interface chemically, similar to corrosive environment. The corrosion process is predetermined and controlled by the ingredients of the formula. Whenever a complete conversion has taken place, a compound of the metal is formed on the surface which is less corrodible than the metal itself. These components are usually metal phosphates, chromates, or oxides, and may be any other compounds of the metal that are insoluble and tightly adherent to the metal surface.[4] The conversion consists of a substantially non-metallic and rust inhibitive film on the metal.

ETCHING

Besides the passive condition of the surface, a slight etch at the interface is of further value. The etch increases the number of anchor stations on the main anchor profile. These added anchor keys and the inhibitive treatment help to reduce or prevent speedy underfilm spread of corrosion whenever a paint film is damaged.

During World War II, a special pretreatment was developed which included a vinyl resin in the formulation. The phosphoric acid in the solution develops a positive etch, the chromate inhibits the metal, and the

vinyl resin acts as a minute insulation. It forms an excellent foundation for most paints. For most satisfactory results, both the chemical and the vinyl pretreatments should be applied to clean metal surfaces. While they will enhance a paint performance on mill scale, their real value is many times greater on blast cleaned, ground, or machined surfaces. A clean surface treated with these chemical reaction or conversion processes offers the paint a wide open and relaxed interface. Paint which is well keyed into a metal assembly will function under less stress than will paint that is applied to an untreated and rigid surface.

REFERENCES

1. Bradley, W. J., "Paints for Structural Steel," 1950 Proceedings of AISC Engineering Conference.
2. Field, Paul, "Some Aspects of Ship Bottom Corrosion," Nov. 1950 meeting of the Society of Naval Architects and Marine Engineers.
3. Liebman, A. J., "Surface Preparation Values and Sandblasting Economics," *Corrosion*, May 1950.
4. Seagren, G., Mellon Institute, Pittsburgh, Pa.

A. J. Liebman, Dravo Corp., before the American Society for Mechanical Engineers, Pittsburgh, April 30, 1951.

MANPOWER

. . . *Government Advises*

The Department of Labor, cooperating with the Engineering Manpower Commission of the Engineer's Joint Council, the American Federation of Technical Engineers of the AFL and various civic organizations, has issued a program to achieve full utilization of the engineering talents of the nation and to expand our supply of engineers.

Suggestions to managers include:

1. Make maximum use of the skills, knowledges and abilities of engineers already employed.

Determine the numbers and kinds of engineers actually needed to meet defense production schedules.

Prepare a skill inventory of present staff and assign them to jobs requiring such skills. (Inventory should include the hidden assets, that is, chemical engineers who have been assigned to activities unrelated to defense engineering).

Then following through, transferring engineers from less essential to defense production.

Find the number of engineers that can be transferred to other defense plants on a leave of absence or loan basis.

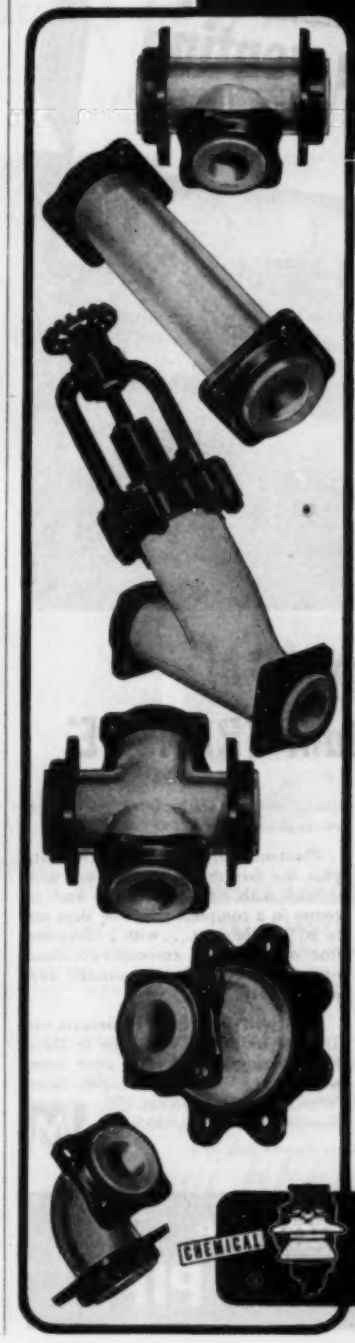
2. Release engineers from routine work, funneling it to assistants, aides, and draftsmen.

3. Training programs.

Prepare lesser skilled technicians to

(Continued)

Install ILLINOIS
PORCELAIN
PIPE, VALVES
AND FITTINGS



for PERMANENT Liquids Handling Systems!

Reduce costly shutdowns with the acid and alkali resistant porcelain that keeps liquids handling systems in constant operation. An Illinois porcelain system will keep production high—will eliminate losses due to corrosion, electrolysis and mineral deposits which affect ordinary fluids handling materials.

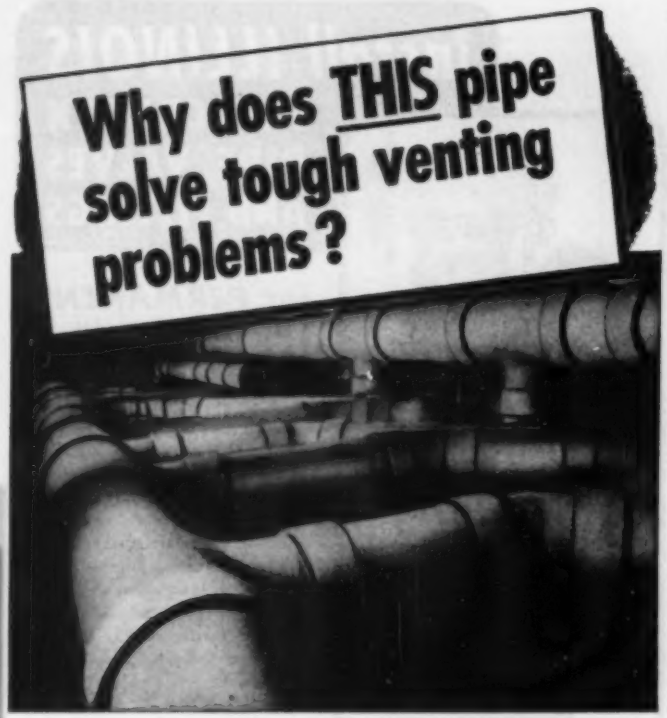
All Illinois pipe, valves and fittings are produced under the highest standards of quality control. Dimensions are accurate, ends are ground true and smooth for gasket mounting, and flanges are jig-assembled. All necessary nuts and bolts are furnished.

Illinois porcelain has inherent corrosion-proof qualities. Its super-smooth, non-absorbent inside surfaces and strong fracture-resistant walls make it outstandingly successful as a chemicals handling medium. No rough or pitted inner walls.

We would be glad of the opportunity to help you solve your corrosion problems.

CHEMICAL
ILLINOIS
ELECTRIC PORCELAIN CO.
MACOMB, ILLINOIS

WRITE FOR FREE CATALOG C-3



...it's made of corrosion-resistant TRANSITE*

IT'S NO SECRET why Transite* Industrial Vent Pipe has solved difficult venting problems for many plant engineers ... and thereby lowered their maintenance costs.

This tough, durable asbestos-cement pipe successfully resists many of the corrosive fumes, vapors, and gases encountered in a wide variety of industrial operations ... helps avoid frequent replacements that waste both time and money.

In addition, Transite Industrial Vent Pipe is non-metallic and therefore rustproof—needs no painting or other protective treatment. It can be used as ducts, vents or stacks in either indoor or outdoor service.

Plant men appreciate its light weight, plus the fact that it can be cut and drilled with ordinary tools. And it comes in a complete range of sizes up to 36" in diameter ... with a complete line of rustproof, corrosion-resistant fittings that adapt it to practically any job requirement.

You will find further details on Transite Industrial Vent Pipe in Data Sheet Series DS-336. For your copy write Johns-Manville, Box 290, New York 16, N. Y. In Canada, 199 Bay Street, Toronto, Ontario.

*Transite is a registered Johns-Manville trade mark

Johns-Manville TRANSITE Industrial Vent PIPE

QED, cont. . .

take over some of the tasks formerly performed by engineers.

Inaugurate supervisory training for engineers who have taken on supervisory responsibilities.

4. Make a study of turnover and absenteeism to identify the factors and conditions contributing to these problems, then begin corrective measures.

5. List engineering openings with local State Employment Service offices. (It is requested that these listings be realistic, and that restrictions on age, handicaps, sex, etc., be relaxed as much as possible.)

Such listings will enable the State Employment Service to render services such as: assisting to find engineers on a part-time or loan basis from other sources; setting up training programs; maintaining national statistics of engineering supply and demand.

. . . Government Acts

The Civil Service Commission has issued instructions to all Federal Agencies regarding the development of a program for maximum utilization of engineering personnel with the Federal Government.

State and county officials are cooperating with State Employment Services in asking each state governor to consider loaning engineers employed by his state, to Federal defense agencies or to other vital defense agencies.

The U. S. Office of Education has developed plans for a reactivation of the Engineering, Science, Management War Training (ESMWT) program followed during World War II for intensive, short-term courses in colleges and universities.

Selective Service boards have been given instructions to give "most careful consideration . . . to all registrants . . . employed in the field of engineering."

The Defense Manpower Administration has been working closely with the Department of Defense to conserve engineering manpower, both military and civilian.

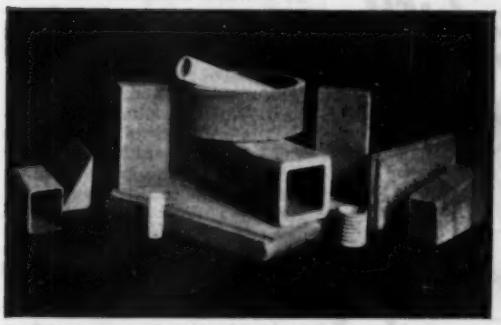
The Bureau of Labor Statistics and the Bureau of Employment Security is working to stimulate enrollment of high school graduates in engineering schools.

The Engineering Manpower Commission of the Engineers Joint Council is becoming more and more vocal and articulate in striving to have put into practice the program outlined above.

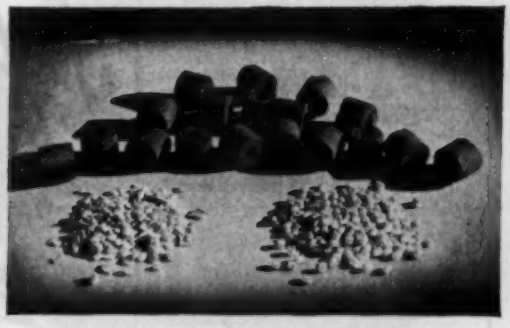
Maurice J. Tobin, U. S. Department of Labor.

(Continued)

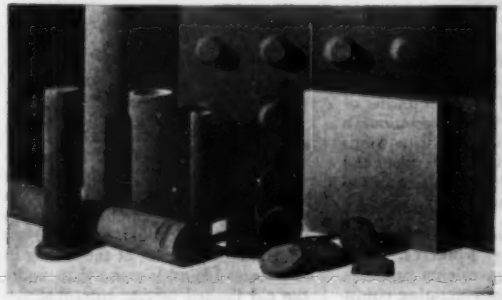
Chemical Stability
Contributes to Wider Usage of Fused Alumina



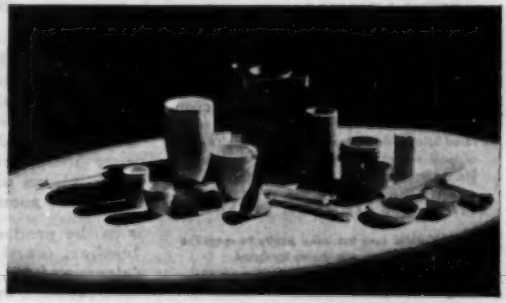
REFRACTORY SHAPES, made of Norton Alundum* mixtures containing 86% to 99.3% fused alumina, resist oxidation in reducing atmospheres at temperatures up to 3450° F. Also highly resistant to chemical attack and mechanical erosion. Write for Bulletin 803.



CATALYST SUPPORTS, made of Norton Alundum mixtures containing 77% to 89% alumina, are highly refractory, chemically inert and extremely durable. Controlled porosity provides wide range of permeabilities and surface areas. Write for experimental samples.



POROUS PLATES AND TUBES made of Norton Alundum grain fired to at least cone 12, are unaffected by acid, neutral and slightly alkaline liquors. They combine uniform permeability with great strength. Write for Bulletin 140.



LABORATORY WARE, made of highly refractory Norton Alundum mixtures containing at least 85% fused alumina (up to 99% in special mixtures), is not attacked by any organic solvent. Write for Bulletin 793.

Investigate! Maybe Norton Alundum shapes can improve your commercial or laboratory processes. The experience of Norton, pioneers in controlling the chemical and physical variables of fused alumina, is at your disposal. Contact your nearby Norton representative or write direct.

NORTON COMPANY, 502 NEW BOND ST., WORCESTER 6, MASS.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

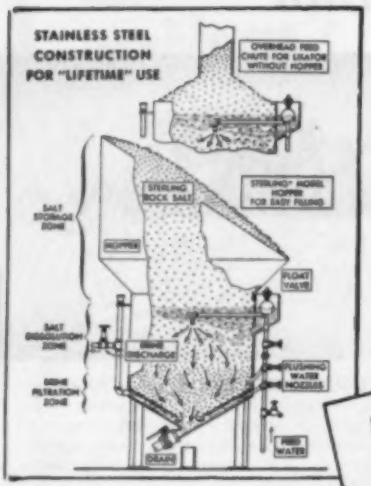
NORTON

Special REFRACTORIES

Making better products to make other products better

Canadian Representative
A. P. GREEN FIRE BRICK CO., Ltd. TORONTO, ONTARIO

SALT! WHY HAUL IT? MEASURE IT? STIR IT?



Just Turn It On!

STERLING ROCK SALT BRINE DELIVERED BY PIPE TO EVERY POINT OF USE IN YOUR PLANT—

HOW LIXATOR* WORKS

In the dissolution zone – flowing through a bed of Sterling Rock Salt which is continuously replenished by gravity feed, water dissolves salt to form 100% saturated brine. **In the filtration zone** – through use of the **self-filtration principle originated by International**, the saturated brine is thoroughly filtered through a bed of undissolved rock salt. The rock salt itself filters the brine. Nothing else is needed.

WHAT THE LIXATOR PROVIDES

- ✓ **Chemical and bacterial purity to meet the most exacting standards for brine.**
- ✓ **Unvarying salt content of 2.65 pounds per gallon of brine.**
- ✓ **Crystal-clear brine.**
- ✓ **Continuous supply of brine.**
- ✓ **Automatic salt and water feed to Lixator.**
- ✓ **Inexpensive, rapid distribution of brine to points of use by pump and piping.**

Savings up to 20% and often more in the cost and handling of salt have been reported by many Lixate users. Why not investigate?

• You can eliminate shoveling, hauling, and laborious hand stirring of salt and water, and frequent testing of the brine strength—with International's Lixate Process for Making Brine. Stops waste through spilling. Saves time and labor. Assures accurate salt measurement . . . no guesswork.

• In the production of chemicals, leather, textiles, plastics, soap, sulphonated oils, petroleum products, food products, in refrigerating equipment such as spray decks and unit coolers, in regenerating zeolite water softeners, the Lixator provides an extremely easy way of measuring salt accurately in the form of brine. YOU SIMPLY TURN A VALVE for self-filtered, LIXATE Brine that ideally meets the most exacting chemical and bacterial standards for every use.

An INTERNATIONAL Exclusive

The LIXATE Process*

FOR MAKING BRINE

*REG. U. S. PAT. OFF.

INTERNATIONAL SALT COMPANY, INC., Scranton, Pa.

QED, cont. . .

INTERMITTENT NOISE

. . . *Effect on Performance*

Loud, intermittent noises have a tendency to increase the quantity and decrease the quality of mental performance, "but these effects are of such magnitude as to suggest that they are practically negligible."

These results were recently reported* by Kendon R. Smith of the Department of Psychology of the Pennsylvania State College.

Two groups of students—an experimental and a control group—were asked to perform a set of clerical tests which were designed for rapid, accurate completion.

The experimental group was subjected to a stimulus of about 100db. ranging in length from 10 to 50 sec. and administered at irregular and unpredictable intervals. The control group worked in silence.

The author concludes that "it may be that the allegedly malignant effects of extraneous noise are to be found primarily in terms of depreciation in sustained performance, or of interference with functions other than adequate output."

*From *Science*.

LABOR

. . . *In the USSR*

"Elements of Soviet Labor Law," an article in the Monthly Labor Review for April, 1951, says that after several decades of state ownership, in which everything theoretically belongs to the working people and there are no capitalists, the lot of the worker in the Soviet Union is worse than under the old limited private enterprise system which existed prior to the Revolution. The trade unions have deteriorated steadily; collective bargaining has virtually ceased to exist.

Under the Soviet system, collective bargaining has been practically abandoned; there are no minimum wage rates. Piece-work rates have been given top priority, with the government setting performance require-

MECHANIZED MINDS . . .

"The Soviet Union and its puppet states comprises about 800 million persons . . . about one-third the entire population of the world. The U. S. and free Europe number 425 million . . ."

KNOX T. HUTCHINSON
Asst. U. S. Sec. Agriculture

ments as well as rates of pay. Wage rates are such that one member of a family of three, working steadily, can scarcely earn enough to provide the bare necessities of life. Practically all women are forced into jobs outside of the home in order to provide support for the family.

Under the old private enterprise law, management was permitted to dismiss a worker for failure to appear at work, without justifiable excuse, for three consecutive days or six days during a month. Under the Soviet regime, this has been shortened to one day, with the further penalty of being evicted from living quarters occupied because of such employment.

In Russia today, tardiness exceeding twenty minutes may result in immediate dismissal. Unauthorized quitting of a job is an offense punishable in court. Loitering on a job, undue prolonging of lunch time and leaving work ahead of time without justifiable reason are subject to disciplinary action and possible court fining.

Leaving the place of employment without express permission of management can be punished with from two to four months imprisonment. If a worker refuses to obey an order to transfer from one job to another, he is punished as though it were an unauthorized leaving of his job (imprisonment).

A worker is financially responsible for any damage caused to the employer through damage to machinery, equipment, etc. This may run from one-third of estimated damages to sevenfold the estimated amount.

From "Economic Intelligence," U. S. Chamber of Commerce.

UNCOMMON METALS

. . . *Much To Learn*

Clyde Williams

What is not yet known about the uncommon metals is vastly more important than what is known.

For cases in point, the phenomenal rise in importance of the uranium and titanium industries can be cited. A decade ago there was only limited knowledge of the potential usefulness of these metals. *(Continued)*

. . . MECHANIZED PROCESSES

". . . Together the United States and Free Europe—outnumbered nearly two to one in population—outproduce the Soviet bloc in terms of industrial output by about three to one."

KNOX T. HUTCHINSON
Asst. U. S. Sec. Agriculture

8 ways you will benefit by attending the . . .

23rd Exposition of CHEMICAL INDUSTRIES

Grand Central Palace
New York City
NOVEMBER 26
TO
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BIRMINGHAM, ALABAMA
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QED, cont. . .

Today as a result of intensive research and development, titanium shows definite promise of reaching production and price levels comparable to those of aluminum, copper, zinc, and other common metals. Titanium output, at a current annual rate of 1,000 tons, may increase 100 or even 1,000 times during coming years. Its price in sheet form may fall from around $15 per lb. at present to about $1 per lb.

Uranium is well known as the "magical" metallic element which has made possible the major new atomic energy development. Prior to that, it was a byproduct of radium operations. Practical applications were largely confined to the ceramic industry where it was used as an ingredient for making the amber glass of railroad and street traffic signals.

There are many other tongue twisters in the uncommon metals group such as zirconium, germanium, molybdenum, vanadium, beryllium, columbium, and cerium. Of the 98 elements reported so far, over two-thirds are metals. Scarcely more than a dozen of these are really common. There is, therefore, a substantial reserve of uncommon metals to draw upon for those unique properties which new advances are always demanding. This reserve is a most vital cog in the growth of the electronics industry and the entire atomic energy program as well as in the better design of jet planes, rockets and gas turbines.

Volume production of the unusual metals so far is small and prices are high compared to the common metals. This has been due to the scarcity of ores, difficulties of extraction, or fabrication costs, or some combination of these factors. Fortunately, in the majority of cases, a large quantity of an unusual metal is not needed to do its job as an alloying agent with common metals.

Dr. Williams' comments have been paraphrased from an article in the August issue of the Cleveland Federal Reserve Bank's Monthly Business Review.

ALUMINUM

. . . *Construction Material*

E. E. Kerns and W. E. Baker

Aluminum is of interest to the refining industry because of its good resistance to corrosives such as sulphides, organic acids, and furfural. Also because of its light weight, good heat-transfer characteristics, and low cost. Occasionally additional benefits are obtained which are the result of a lesser tendency to foul up in a specific service. *(Continued)*

CHAPMAN

TILTING DISC CHECK VALVES

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Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

There's less wear on seating surfaces, hinge pins and bearings with the cushioned closing action in a Chapman Tilting Disc Check Valve. No destructive slamming. No fatiguing flutter. No vibration of pipe lines or adjacent structure — nor danger of opening pipe joints or rupturing pipe lines. Just a quick and quiet closure that cuts maintenance costs.

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Dept. A, 220 Liberty St., Warren, Pa.

QED, cont. . .

Inasmuch as aluminum is usually anodic to other common materials of construction, care must be exercised that the equipment is properly designed so as to minimize galvanic attack.

Some actual refinery installations are reviewed below:

CRUDE AND THERMAL CRACKING

Test No. 1: This was a vapor heat exchanger associated with a lubricating-oil-crude-topping unit. As noted, both steel and copper-alloy tubes are subject to rather severe sulphide corrosion. Preliminary tests indicated the suitability of aluminum 61ST alloy, and a trial bundle was installed. Failure occurred in one month's time; this failure took the form of severe pitting from the vapor side. Damage was so extensive that repairs were not possible. The vapor is largely gasoline, with hydrogen sulphide and water present in appreciable quantities. The pH of the vapor is controlled to approximately 7 by ammonia injection into the vapor line. The attack was more intense near the outlet and in dead areas near the baffles.

The tubes were carefully examined in the laboratory, where spectrographic analysis revealed minute quantities of mercury in the corrosion pits. It is probable that the very active aluminum-mercury cell was responsible for the attack. The source of the mercury is not known, although it is known that California crudes often contain traces. It is also known that traces of mercury can cause severe attack of aluminum.

Test No. 2: This concerns a small experimental 6-in. pipe exchanger, where a 3S and two Alclad 3S tubes were installed. The exchanger is in parallel with the top condensers on a topping unit which handles sour vapors into which water vapor and ammonia have been injected. The experience was very similar to test No. 1, in that 16-gage tubes were completely pitted through in 2 mo. time.

PROGRESS FOLLOWS RESEARCH . . .

"I cannot help but look with envy at the research funds . . . to industries that compete with cotton . . . In 1938, six major chemical companies employed about two-thirds as many research people as the entire Department of Agriculture . . . In 1942, these companies employed the same number as the department. Last year, they employed about 50 percent *more* research people than the whole Department of Agriculture.

KNOX T. HUTCHINSON
Asst. U. S. Sec. Agriculture

Test No. 3: This case concerns a small all-aluminum exchanger which takes thermally cracked gasoline vapors. No cause is yet known for the corrosion of a small hole through the shell in 13 mo.

CATALYTIC CRACKING SERVICE

Tests No. 4, 5, and 6: These constitute a series of tests being carried out in one of our refineries. Test No. 5 was an experimental all-aluminum exchanger supplied by the Aluminum Company of America. After a successful 4-mo. test, the refinery retubed an existing skeleton with Alclad 3S tubes; two all-aluminum bundles were also purchased for trial (these were used for test No. 6).

The corrosion conditions are rather complex. It has been found that the operation of this fixed-bed catalytic cracker causes a constant cycling of pH of the condensate. The range in pH varies from about 6 to 8.5, and this swing would be greater if it were not for recycling the condensate water back into the vapor line and injecting ammonia during the acid portion of the cycle.

The all-aluminum bundles have been in service for four months, and no trouble has been reported to date. The retubed bundle (test No. 7) was found to be leaking after 6 mo. service. Severe corrosion was found with gaping holes, about 1 in. long, which had been opened in the tubes adjacent to admiralty tie-rod spacers which had been used. The corrosion products, which are largely copper and zinc sulfides, were in contact with the tubes adjacent to the spacers. This condition was very troublesome. Holes were opened up where tubes had passed through the steel baffles. These are thought to have resulted in part from accumulation of copper corrosion products, as there was little evidence of galvanic action at the juncture of the tubes and tube sheets.

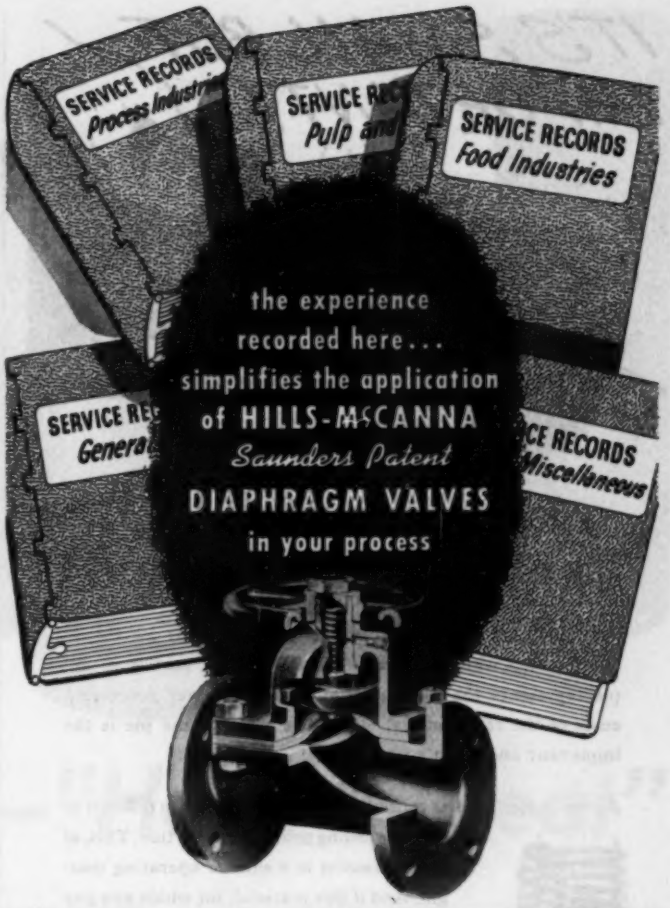
On the water side it was also noted that the tube ends were corroded,

(Continued)

. . . ERGO, RESEARCH CAUSES PROGRESS?

"In 1938, 3,208 million pounds of cotton were made available to ultimate consumers in the U. S.; rayon and other synthetics accounted for 331 million pounds. In 1942, cotton output had increased 69 percent over the '39 figure, while synthetics increased by 91 percent. In 1950, cotton had dipped 13 percent below the '42 figure while synthetics had jumped 137 percent above the 1942 output."

Southern Regional Research Laboratory
U. S. Department of Agriculture



If you are conveying corrosive or hard-to-handle fluids, a Saunders Patent Diaphragm Valve may be the answer to your valving problems. If so, the experience recorded in the five volumes illustrated above is your best assurance of getting the *right* valve for your needs. In these records are body and diaphragm material recommendations for handling some 2500 substances, based on Hills-McCanna's nearly 20 years' experience in the manufacture and application of Saunders Patent Valves. If you have a tough valving problem, let this "know-how" work for you.

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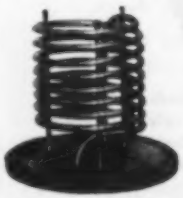
As raw material costs continue to increase, it is often difficult to increase selling prices in proportion. This, of course, results in a smaller operating margin. And if this material, for which you pay more, is subject to corrosive attack, there is the problem of spoilage through contamination from corroded processing equipment. This makes the going really tough.



Tantalum steam coil for rapid heating of contents of agitated kettle.

When considering all this, you will come to realize that the small additional investment you make in acid-proof tantalum equipment is a worth-while expenditure. Consult with Fansteel engineers on the possibility of using tantalum equipment in your operations. Fansteel Metallurgical Corporation, North Chicago, Ill., U.S.A.

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Acid Proof TANTALUM CHEMICAL PLANT EQUIPMENT

QED, cont. . .

where they were adjacent to type 304 stainless cladding. The tubes most affected were in the topmost row, and the others were less affected. It is thought that zinc strips would protect the topmost tube ends.

Test No. 7: This is another case of a test exchanger which is installed in the overhead condensing service of a catalytic cracker. This test is apparently successful after nine months.

E. E. Kerns and W. E. Baker, Standard Oil Co., (Ohio), before the American Petroleum Institute, Tulsa, May 1, 1951.

LUBRICATING OILS

. . . *Extraction Processes*

E. J. Dawson

Recent progress in solvent extraction has been in development of existing techniques. The advances have been in size of plant and in economy and simplicity of layout and operation.

There has been a swing in favor of extraction towers instead of mixer-settler systems since towers exhibit advantages in capital cost and in ease and economy of operation. These advantages are, however, gained at the expense of some efficiency and accordingly much effort is currently being directed to improving extraction equipment.

The rotating disk contactor, pulsating flow columns, columns with alternate packed and mixer sections and centrifugal contactors are examples of this trend.

E. J. Dawson, Shell Refining and Marketing Co., Ltd., before the Third World Petroleum Congress, The Hague, The Netherlands, May 28–June 6, 1951.

THIOPHENE

. . . *From Hydrocarbons and H_2S*

R. F. McCleary, et al.

Thiophene may be prepared from hydrocarbons and hydrogen sulphide over a variety of catalysts including chromia or molybdena on alumina, bauxite, or silica.

Production of thiophene is greatest from the normal C_4 hydrocarbons especially the olefins. When using hydrocarbons containing more than four carbon atoms in a straight chain not only thiophene but also alkyl thiophenes are formed. The reaction is mildly endothermic and can easily be carried out in fixed-bed system. Preferred catalysts can be regenerated with air. Because of the highly

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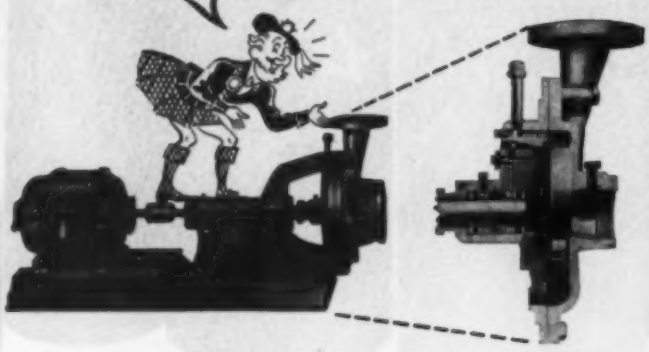

Deming Fig. 4012 Side Suction Centrifugal Pump. Two Ball Bearing Type with Separate Liquid End.

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Complete details including performance tables are covered in BULLETIN No. 4012-A. Write for free copy.

THE DEMING COMPANY
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DEMING DEPENDABLE PUMPS

QED, cont. . .

exothermic nature of the regeneration, a fluidized catalyst system is advantageous in permitting more rapid regeneration of the catalyst at a given maximum temperature.

R. F. McCleary, L. E. Ruidisch, C. H. Culnane and R. E. Conary, the Texas Co.; J. T. Clarke, Ethyl Corp.; and L. W. Devaney, Baylor University.

GAMMA RAYS

. . . *Preserve Foods*

A Columbia University research team, using huge doses of normally deadly radioactivity, has succeeded in preserving milk up to periods of at least one month under ordinary refrigeration.

The results may be of great significance to the food industry, in view of the versatility of the radioactivity method, which, according to the university researchers, is such that it may be used to produce a wide variety of preserved foods.

The research group, made up of two chemical engineers and a radiologist, utilized a 2,000,000-volt X-ray machine to achieve the preservation of the raw milk. This machine is part of the equipment of the new city-built Francis Delafield Hospital at the Columbia-Presbyterian Medical Center. The rays produced by the machine are substantially the same as the gamma rays produced by an atomic pile.

The Columbia investigators found that the milk could be preserved up to as much as seven weeks without resorting to heating or freezing, and that its flavor, nutritive value and appearance remained unimpaired. Equally important was the discovery that no residual radioactivity could be detected.

Members of the group used raw unpasteurized milk in the tests.

They reported that samples of the milk were treated with as much as 100,000 Roentgens of radiation. It was discovered that the vitamin content was unimpaired at the radiation levels of commercial interest, and that no residual radioactivity could be de-

BUILDING UP . . .

"Over 90 percent of the molecules in today's military aviation gasoline are not present in the crude oil, but are made by synthetic chemical processes, most of which were unknown 20 years ago."

ROBERT E. WILSON
Chairman of the Board
Standard Oil Co. (Indiana)

tected in samples receiving up to 1,000,000 Roentgens of radiation. Ten Roentgens are usually sufficient to kill a man.

The samples were then stored under different conditions, and their storage life was compared with that of raw milk and pasteurized milk. The irradiated milk was found to remain salably fresh from greatly extended periods, depending on the amount of radiation the samples received. Milk receiving dosages now readily obtainable by using available mixed fission byproducts from atomic piles kept a minimum of one month under ordinary refrigeration.

The scientists said that the effectiveness of radiation in preserving food is due chiefly to its ability to destroy bacteria and to check enzyme activity, the major causes of food spoilage. The principle is essentially the same as that used in regular canning operations, except that the use of heat to effect destruction of microorganisms and enzymes is avoided.

While the 2,000,000-volt X-ray unit at the Delafield Hospital was used as the source of radiation, the same dosage can be obtained from byproducts of atomic piles. These byproducts, which for the most part are unused today, are being made available to Columbia by the Atomic Energy Commission for future experiments.

The Columbia scientists have not yet determined if the irradiated milk is fit for human consumption. A large-scale animal testing program is being initiated. In this program, which will be directed by Dr. Charles Glenn King, noted Columbia nutrition expert and chemist, the irradiated milk will be fed to fast-reproducing animals to determine whether this method of preservation has an adverse effect on the growth rate, reproductive processes or hereditary characteristics of the animals.

The Columbia research will now be extended to other food products. A major problem for the investigators will be the development of techniques for commercial preservation, once the adequacy of preserved products has been finally determined. Another possible use advanced for the radioactivity method is the preservation of surgical supplies in an antiseptic state for

(Continued)

. . . AND UP

"In the last 25 years the proportion of our total organic chemicals produced from petroleum has increased from less than 0.1 percent to about 36 percent."

ROBERT E. WILSON
Chairman of the Board
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A REGULAR SERVICE OF THE **COOPER ALLOY** FOUNDRY CO., HILLSIDE, N. J.

Technical Topics

MACHINING 18-8 STAINLESS STEEL . . . METALLURGICAL CONSIDERATIONS

Norman S. Mott
Chief Chemist and Metallurgist

Most of the headaches associated with the machining of stainless alloys can be cured with machining experience, but some of them are associated with metallurigal considerations. This applies both to the wrought and the cast materials. Too often the underlying causes and the possibilities for their correction are not well understood. The purpose of this discussion is to review these causes, and to indicate the steps which may be taken to eliminate them.

The basic difficulties experienced in the machining of stainless alloys are:

1. The metal is too hard. . . . The cutting tool cannot penetrate or too much cutting tool pressure is required.
2. The metal is too tough. . . . It tears away instead of breaking up into chips.
3. Frictional or galling characteristics are excessive. . . . Chips adhere to the tip on the tool, resulting in the balling up of the cut metal.
4. Microstructural non-uniformity or segregation. . . . This causes hard spots and results in rough or uneven machined surfaces.
5. The metal work hardens. . . . This results in a blunt tool and a polishing rather than a cutting action. Let us review each of these difficulties in turn:

Hardness: Hardness in 18-8 stainless, such as to cause difficult machining is not an inherent characteristic. It is usually found in the form of work hardening, either from cold rolling or from hot working to too low a temperature. Although machining operations have been conducted up to as high as 350 Brinell, this requires a slow special technique and for practical purposes such hard metal should be soft annealed by water quenching from 1950-2100° F.

Toughness: Correctly heat treated 18-8 stainless in the condition for maximum corrosion resistance is very tough and ductile. These are desirable characteristics from a mechanical viewpoint, but they are pretty tough on machinability. Experience has shown that machining difficulties can be minimized through the addition of an embrittling agent such as selenium, sulphur or phosphorus. And when properly controlled, maximum machinability with a minimum loss of corrosion resistance can be accomplished.

Galling: Galling tendencies, which are associated with softness and ductility, are also largely eliminated by controlled additions of various alloying elements.

Hard Spots: Hard spots are caused by microstructural segregations such as carbides and other hard phases. The machining tool in passing over these areas does not cut properly and gives a raised and usually a glazed surface, producing a so-called "orange peel" effect. Correct quench annealing heat treatment is required in order to eliminate such a condition. Another cause of hard spots may be burnt-in pieces of molding sand, a condition sometimes found in poor quality castings.

Work Hardening: Work hardening is a universal characteristic of the 18-8 stainless steels. Pressure by the machine tool tends to cold work the surface and make it hard. To offset this, there are a number of machinists' tricks which are somewhat beyond the scope of this discussion. (Further data on the machining techniques can be found in J. J. Roberts' paper, "Don't Fear Threading of Stainless.")

Available on Request

Copies of this article, printed on heavy stock in convenient filing form are available. In addition, reprints of Mr. Roberts' more complete paper will gladly be sent to you, without obligation, in small quantities. Address your requests to Publicity Dept., The Cooper Alloy Foundry Co., Hillside 5, N. J.

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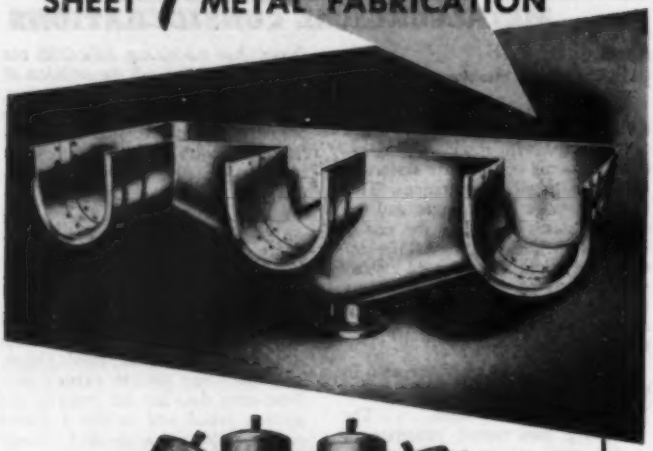

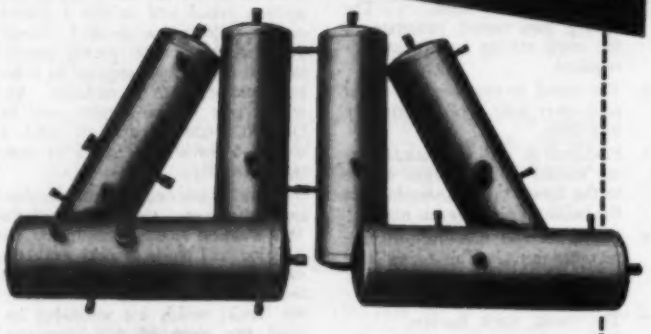

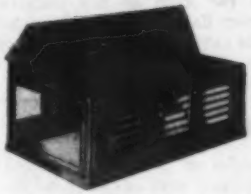

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QED, cont. . .

operations and other medical purposes.

The fission byproducts which are now available for preservation experiments include the radioactive elements found in the water used for cooling and shielding in atomic piles. At present these byproducts are stored underground in shielded containers. The Atomic Energy Commission is making them available to the Columbia researchers in their effort to discover possible uses for these now-wasted products.

Elmer L. Gaden, Jr., Ernest J. Henley, Vincent P. Collins, Columbia University, before the Institute of Food Technologists, New York, June 20, 1951.

LPG

. . . Markets Expanding

R. C. Alden, Forrest E. Gilmore & Paul W. Tucker

The total liquefaction of liquefied petroleum gas (LPG) is estimated to have increased from 165,000 bbl. per day in 1940 to 668,000 bbl. per day in 1950. The uses in 1950 were 168,000 bbl. per day for butanizing motor fuel, 262,000 bbl. per day as refinery conversion stocks, and 238,000 bbl. per day to sales. The annual rate of growth of the liquefaction of LPG has been about 15 percent. Of the three uses cited, the two refinery uses are in approximate equilibrium with the 6-percent rate of growth in production of gasoline. However, the sales of LPG have been increasing 26 percent annually.

An analysis of the individual markets for LPG shows that all but one of the markets have been increasing at a lesser annual rate than 26 percent in recent years. The use of LPG for power purposes is the exception.

More than half of the C_3's and C_4's available in current refinery operations are being liquefied, whereas less than a fourth are being liquefied in current natural-gas operations. It is estimated that 739,000 bbl. per day of additional quantities could have been liquefied in 1950. In the 1950 U. S. petroleum reserves there was potentially 0.9 gal. of LPG for every gallon of gasoline.

With suitable market incentives, such as the current rapidly increasing power uses, there is every reason to believe that LPG production will continue its past high rates of growth. Such a development would be a substantial step in conserving liquid-fuel supplies and, if sufficiently accelerated, could be an important phase of the mobilization of the oil industry.

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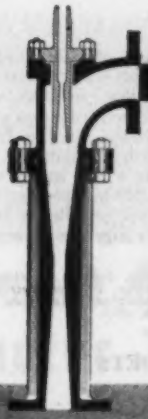

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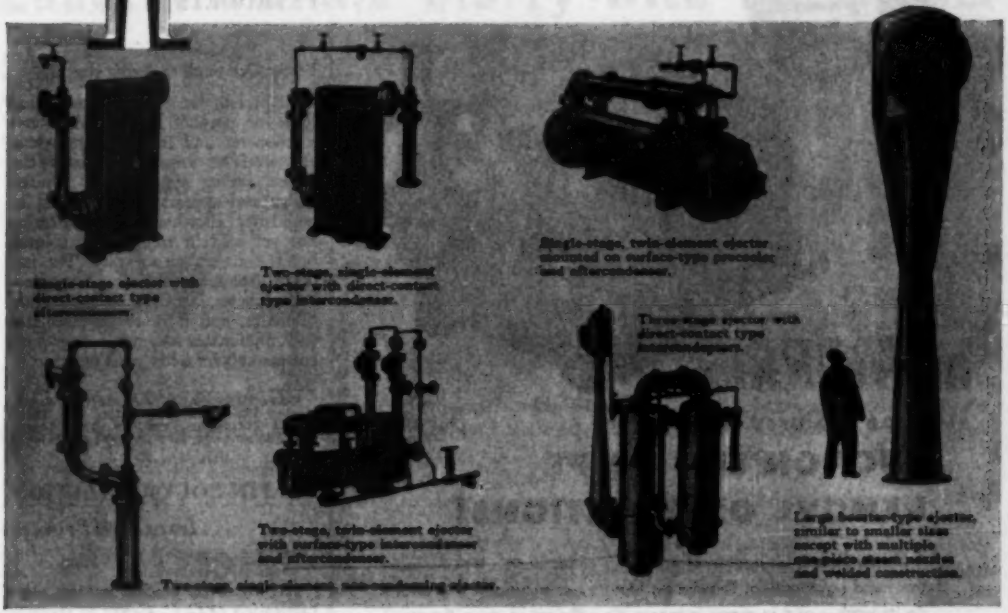
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Single-stage, twin-element ejector mounted on surface-type precooler and aftercondenser.
Two-stage, twin-element ejector with surface-type intercondenser and aftercondenser.
Large booster-type ejector, similar to smaller sizes except with multiple one-piece steam nozzles and welded construction.

Whatever the capacity—whatever the gases or vapors to be handled—Ingersoll-Rand steam-jet ejectors can generally do the job far more economically than any other type of equipment. Their utter simplicity of design and operation assures long life and sustained high efficiency, with practically no maintenance at all.

Suction pressure is obtained by a steam-jet discharging into a specially formed suction chamber and venturi-shaped diffuser. That's all there is to it. There are no moving parts to wear out—no excessive noise—no vibration. Ejectors can be installed anywhere, with little or no foundation, and can be operated by inexperienced personnel.

Single-stage, two-stage and multi-stage ejectors can be supplied in any required combination—with pre-coolers, intercondensers and aftercondensers to meet the specialized needs of practically any application for suction pressures down to 50 microns (.002" Hg absolute).

Ingersoll-Rand's unequalled experience in vacuum equipment—both steam-jet ejectors and reciprocating pumps—is your assurance of impartial service in meeting your low-pressure requirements. For further information, contact your nearest I-R representative, or write for a free copy of Bulletin 9013A.

Ingersoll-Rand

11 Broadway, New York 4, N. Y. 482-4

COMPRESSORS • AIR TOOLS • ROCK DRILLS
TURBO-BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS
DIESEL & GAS ENGINES

In MORRIS

Type R Slurry Pumps

SUCTION LIFT HELPS REMOVE OBSTRUCTIONS!

A Morris Type R is capable of operating under suction lift . . . positive head not required! This design feature lets atmospheric pressure do its work — and in many instances it's sufficient to clear the stoppage. Shutdowns and dismantling of pipe lines are greatly reduced.

And when there are cases calling for pump dismantling, the job is relatively simple with Morris Type R. By loosening four bolts, off comes the end cover — and you can take a quick look at the inside. Unscrew the impeller, if necessary. But you don't have to disturb the pipe line at all.

Small wonder Morris Type R is so popular. Flow is maintained so reliably throughout the range from heavy slurries to foaming slurries, that a lot of operating problems are answered. Get the full story of this many-feature pump. Write for Bulletin 181.

MORRIS MACHINE WORKS Baldwinsville, N.Y.

Branch Offices in Principal Cities

MORRIS Centrifugal Pumps

QED, cont. . .

In any event, the sales of LPG have attained a size where future growth, even at less than past rates, will have substantial repercussions on all phases of the industry. If the 26-percent rate of growth is maintained in 1951, it will mean a new supply of liquid fuels of 62,000 bbl. per day, which is the equivalent of either a large new oil field or a large new refinery.

R. C. Alden, Forrest E. Gilmore and Paul W. Tucker, Phillips Petroleum Co., before the American Petroleum Institute, Tulsa, May 3, 1951.

PETRODETS

. . . *Markets*

Foster Dee Snell & Irving Reich

At present the two most promising types of product are the alkyl aryl sulphonates and the polyoxyethylene ethers. The former is already the largest selling type in the United States and appears to be gaining in popularity elsewhere. The latter is not yet sold in tremendous volume but is certainly on its way. The fat-based detergents, including fatty alcohol sulphates, fatty acid monoglyceride sulphates, and fatty amide sulphates and sulphonates may retain their present markets for a few years to come.

Foster Dee Snell and Irving Reich, Foster Dee Snell Inc., before the Third World Petroleum Congress, The Hague, The Netherlands, May 28–June 6, 1951.

OLEFIN POLYMERIZATION

. . . *Improved Process*

C. E. Langlois & J. E. Walkey

An improved process for the polymerization of C_3-C_4 olefins to produce motor gasoline uses a catalyst which consists of a film of phosphoric acid on crushed quartz. It has the advantages of low cost, high mechanical strength, ease of regeneration, and of permitting simple reactor design.

Correlation of the results of an extensive pilot-plant program and of many years of commercial operation provides the basis for selection of optimum operating conditions for any refinery stock situation. The improved process, employing fine-mesh quartz and feed quench, and operating at optimum acid concentration, pressure and temperature, results in exceptionally low investment and operating costs.

C. E. Langlois and J. E. Walkey, California Research Corp., before the Third World Petroleum Congress, The Hague, The Netherlands, May 28–June 6, 1951.

—End

Published by SCHUTTE and KOERTING Company

ENGINEERING News

DRY APPARATUS • HEAT TRANSFER EQUIPMENT • STRAINERS • CONDENSERS AND VACUUM PUMPS • OIL BURNING EQUIPMENT

Efficient Gasoline Sweetening Process Uses Eductor To Mix Slurry With Petroleum

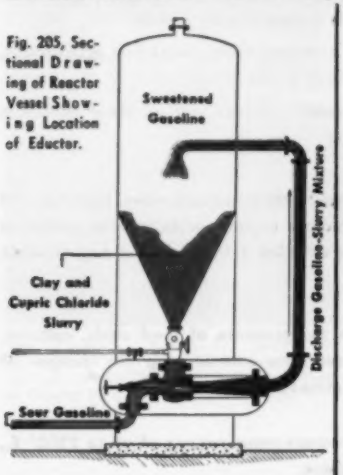
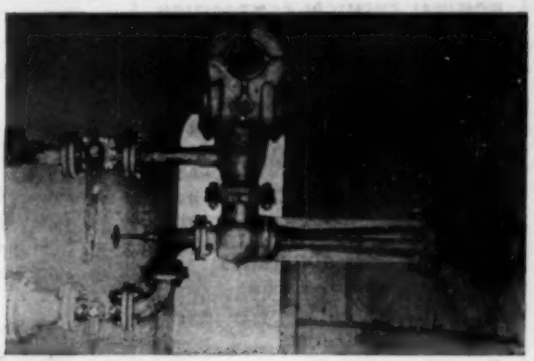


Fig. 205, Sectional Drawing of Reactor Vessel Showing Location of Eductor.



SK 4" Fig. 205 Jet Eductor Used to Mix Distillate and Cupric Chloride Slurry.

An excellent example of the manner in which an SK Jet Eductor can be used to mix a slurry with a liquid is an application at the El Dorado, Kansas, refinery of Skelly Oil Company.

As a part of a very significant process designed for the copper sweetening of sour gasoline, Skelly engineers have incorporated an SK Fig. 205 Jet Eductor to entrain and mix a slurry reagent with the liquid to be treated. The eductor is located at the base of a cupric chloride reactor at the apex of the conical bottom of this vessel as shown in the photo above.

Fig. 205 shows how the eductor operates. Distillate, which has been made moisture-free in a salt tower and heated in a heat exchanger, is used as the pressure liquid. The velocity of this distillate, as it issues from the eductor nozzle, entrains the slurry reagent and the two are mixed intimately in the throat of the eductor. The mixture discharges into a transfer line which leads back into the reactor. The treated distillate is taken from the top of the reactor and is sent through additional processing.

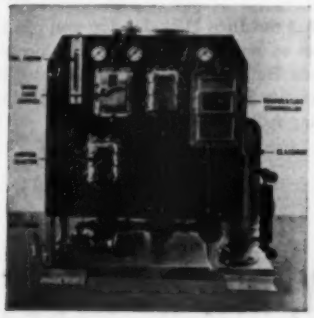
Many chemical plants are using SK Jet Eductors to lift, pump, mix, and agitate liquids and to handle solids and slurries because of their efficient operation, their economy, and their low maintenance requirements.

Bulletin 2-M offers complete details on the many types available, their construction, operation, and characteristics. Send for a copy.

SCHUTTE and KOERTING Company
Manufacturing Engineers
CORNWELLS HEIGHTS
BUCKS COUNTY, PA.

Blaw-Knox Company uses SK Panel Mounted Universal Rotameters to meter filtered oil on this company's Electroil Foggers as shown in the photo below. Since the Fogger is used for producing a stable oil fog in a gas stream, the accuracy of fluid flow is important. SK Rotameters offer the desired accuracy.

For information on all types of SK Rotameters, request Bulletin 18-RA.



INCONEL

INCONEL

At home in 2200 degree heat or protecting delicate Chloromycetin . . . this modern high-Nickel alloy solves many of industry's most troublesome metal problems.

NOMINAL CHEMICAL COMPOSITION
(Wrought)

Nickel	77.
Chromium	15.
Iron	7.
Manganese	0.25
Copper	0.2
Silicon	0.25
Carbon	0.06
Sulfur	0.007

PHYSICAL CONSTANTS

Density, lb./cu. in.	0.307
Melting Range	2540°—2600°F.
Specific Heat (77°—212°F.)	0.109
Thermal Expansion Coefficient in./in. (100°—200°F.)	0.0000064
Thermal Conductivity (100°—212°F.) Btu/sq. ft./hr.°F./in.	104
Modulus of Elasticity in tension and compression, psi	31,000,000
in torsion, psi	11,000,000
Poisson's Ratio	0.29

MECHANICAL PROPERTIES

Figures shown are for standard cold-rolled sheet, hard. Variations will occur for different forms and tempers.

Tensile Strength	125,000 to 150,000 psi
Yield Strength (0.20% offset)	90,000 to 125,000 psi
Elongation in 2 in.	15% to 2%
Rockwell C. hardness	25 to 29

FORMS

Wire	Bar	Plate	Pipe
Rod	Angles	Sheet	Strip

Seamless and welded tubing

Sand and precision castings

Clad-Steel Plate and Strip — Welding Rods

Combining remarkable thermal durability, corrosion-resistance and strength... Inconel* is unique among metals.

Inconel is a thoroughly *practical* metal: workable, economical, produced in many convenient forms.

Inconel... and only Inconel... brings you *all* these desirable properties in a single alloy:

- **Unusually high resistance to chemical corrosives, both hot and cold, such as fatty and other organic acids, caustic alkalis at high temperatures, hot alkaline sulfides and strong chloride solutions.**
- **Exceptional stability in the presence of food acids, cultures, ferments, alcoholic beverages — minimizing the danger of harmful metallic contamination.**
- **Ability to withstand constant temperatures of up to 2200° F., in sulphur-free atmosphere.**
- **High strength, both hot and cold.**
- **Good spring properties, especially valuable in high-heat applications.**
- **Good workability . . . can be machined, cast, forged, formed . . . can be joined by welding, brazing, or soldering. Welded joints are as corrosion and heat-resisting as the alloy itself.**

At present you may find that the Inco Nickel Alloy you need is hard to get. That's because so much of Inco's production is being diverted to defense needs. But, if you have a special metal problem, Inco's Technical Service Section will be glad to help you solve it. Write today giving full details.

*Reg. U. S. Pat. Off.

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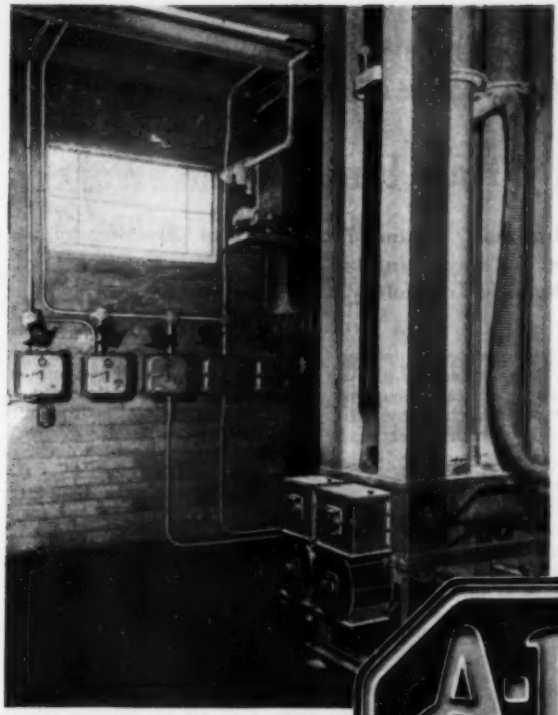
INCO

TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.



Five Allen-Bradley Bulletin 713 Combination Starters in NEMA 9 Enclosures used to operate the Dust Collector Unit in the Bulk Mixing Plant of Pillsbury Mills, Inc., Springfield, Illinois.

Where you need SAFE ENCLOSURES Install TROUBLE FREE ALLEN-BRADLEY STARTERS

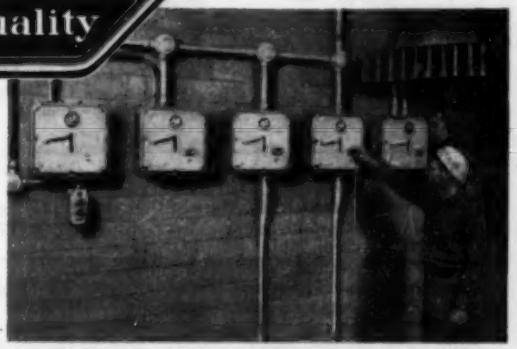
● Where explosive grain dust is present, install Allen-Bradley motor controls in NEMA Type 9 enclosures. Constructed of cast iron with wide machined flanges, these sturdy bolted enclosures provide maximum protection. Allen-Bradley solenoid starters are ideal for bolted enclosures . . . their simple design, only ONE moving part, guarantees millions of trouble free operations . . . Furthermore, their double break, cadmium silver alloy contacts require no maintenance, hence the cover need not be taken off for contact inspection—a time and money saving feature in starters with bolted enclosures. Dependable overload relays, easily reset without opening the starter cabinet, provide reliable, accurate overload protection. Allen-Bradley has a safe enclosure for every kind of job . . . wet, hazardous, dusty, corrosive. Write for motor control information.

Allen-Bradley Co., 1337 S. First St., Milwaukee 4, Wis.

A-B Quality

In Hazardous Dust Locations Protect Men and Equipment with NEMA 9 Enclosures...

Allen-Bradley Bulletin 713 Combination Starter in a NEMA 9 Enclosure for hazardous dust locations. A-B Combination Starters are interlocked, and the operating handle has three positions to make it foolproof.



A close-up view of the above showing the Bulletin 713 Combination Starters in greater detail and also the two Allen-Bradley Bulletin 800 Push Buttons.

One of a broad line of Allen-Bradley Bulletin 800 Heavy Duty Push Buttons.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

Your ECT Is Still Only Half Finished

In spite of what you may have heard or read, Volume 7 and not Volume 6 probably marks the half-way point in the completion of the Encyclopedia of Chemical Technology.

ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY. Vol 7: Furnaces to Iolite. Edited by Raymond E. Kirk and Donald F. Othmer. Assistant editors: Janet D. Scott and Anthony Standen. Interscience Encyclopedia, New York. 982 pages. Subscription price $25.

Every Wednesday afternoon six people gather around a table in a private office in Brooklyn. They come to plot. To plot the course of the Encyclopedia of Chemical Technology. They are the editors and publishers of this growing series. Their seventh volume is now ready.

You have already met the four editors here: Kirk, Othmer, Scott, Standen. Messrs. Dekker and Proskauer are the representatives of Interscience Encyclopedia, Inc.

These six are responsible for ECT. Between them they have to decide on subjects, garner authors, supervise editing, set production schedules, sell books.

The Wednesday meetings nowadays are largely concerned with present and future manuscripts—authors for those still to be gotten; reviewers for those at hand. And special problems, too, as they arise: for example, what to do with a totally unacceptable manuscript.

Out of the meetings have come seven books. I have introduced six of them to you as they came along. Now here's the seventh. And I feel like a small boy who has been popping candies into his mouth one after the other. Each is better than the one before. Suddenly his gusto becomes disgusto. The last one wasn't so good. Just as if he had been eating ice cream and then went back to his meat and potatoes.

So it is with Vol. 7 of ECT. We are back to meat without much flavor. Vol. 6 was the high spot in the series so far. Articles were interesting reading, well presented, on interesting subjects. They were perked up, you remember, by tigers, virgins, oysters, nightmares, murder and suicide.

Let's substantiate my appraisal by a closer look at Vol. 7. While we're at it, let's make it easier by dividing the book's sixty-odd entries into a few categories: chemicals, groups of chemicals or products, chemistry, technology and equipment, trades and industries.

CHEMICALS

In this class we have 16 entries. Look at the list: gelatin, germanium, glycerol, hafnium, helium, hydrazine, hydrochloric acid, hydrogen, hydrogen peroxide, hydroquinone, hydroxylamine, indium, indole, inositol, insulin, iodine. Some are mighty important industrially but there is no ice cream here, it's all meat. The hydrochloric acid survey, by Gershon, is a model commodity survey covering chemistry, uses, production methods, materials of construction.

GROUPS

Into this class I have put 22 of the ECT entries: gas (natural), gasoline, gas warfare agents, gems (synthetic), glycols, glycosides, gold (alloys and compounds), gums, helium group gases (Ne, A, Kr, Xe), hemostatics, hetero-cyclic compounds, heteropoly acids, histamine and anti-histamine agents, hormones, hydrocarbons, hypnotics, imides, imines, incendiaries, indigoid dyes, ink (writing), insecticides. They range in length from 1 to 72 pages. The spread in value is just about as great. Gasoline is historical; will be treated fully under petroleum. Gems is interesting; you won't be making any, though. Gold is a weak entry; uses of compounds could be more specific. Hemostatics: reassuring. Hormones—of great interest right now—stress is chemistry, not biology. Hydrocarbons, by Egloff, is a nice technologically instructive survey on a very broad subject. Many hydrocarbons (methane, ethane, acetylene, etc.) have their own entries. Indigoid dyes is adequate but not one of the best ECT dye articles. D. E. H. Frear's insecticides are as you would expect from this authority. Insect repellents summarizes data on chemicals for personal use.

CHEMISTRY

Here we find: gas analysis, gases and vapors, Grignard reaction, hydrogen ion concentration, indicators, and a half page by Editor Kirk on hydration. They are all adequate surveys running 7 to 16 pages (with the exception noted).

TECHNOLOGY

Here's the real value. Furnaces (electric) and furnaces (fuel fired) are by the authorities Paschkis and Mawhinney. Johnstone's gas cleaning and purification article is fine, be sure to look at it. Heat transfer, by Skaperdas, and heat transfer media, by Danziger, are both sound engineering round-ups. (I include hardness and humidity in my technology classification.) Hydraulic systems are properly included because they are now part of mechanical and chemical technology.

(*Continued*)

As if We Didn't Know . . .

"Less expensive furs are usually processed to simulate more expensive ones." (p. 1)

"As one of the most important fuels, natural gas is an important mineral commodity of commerce." (p. 59)

"The use of gasoline as a fuel for motors is scarcely more than half a century old." (p. 113)

"Military use of ammunition in wartime is notoriously extravagant." (p. 118)

"From earliest times, gemstones have held a particular fascination for mankind." (p. 157)

"Gold is present in sea water, but in so dilute a state that it is not commercially feasible to extract it." (p. 275)

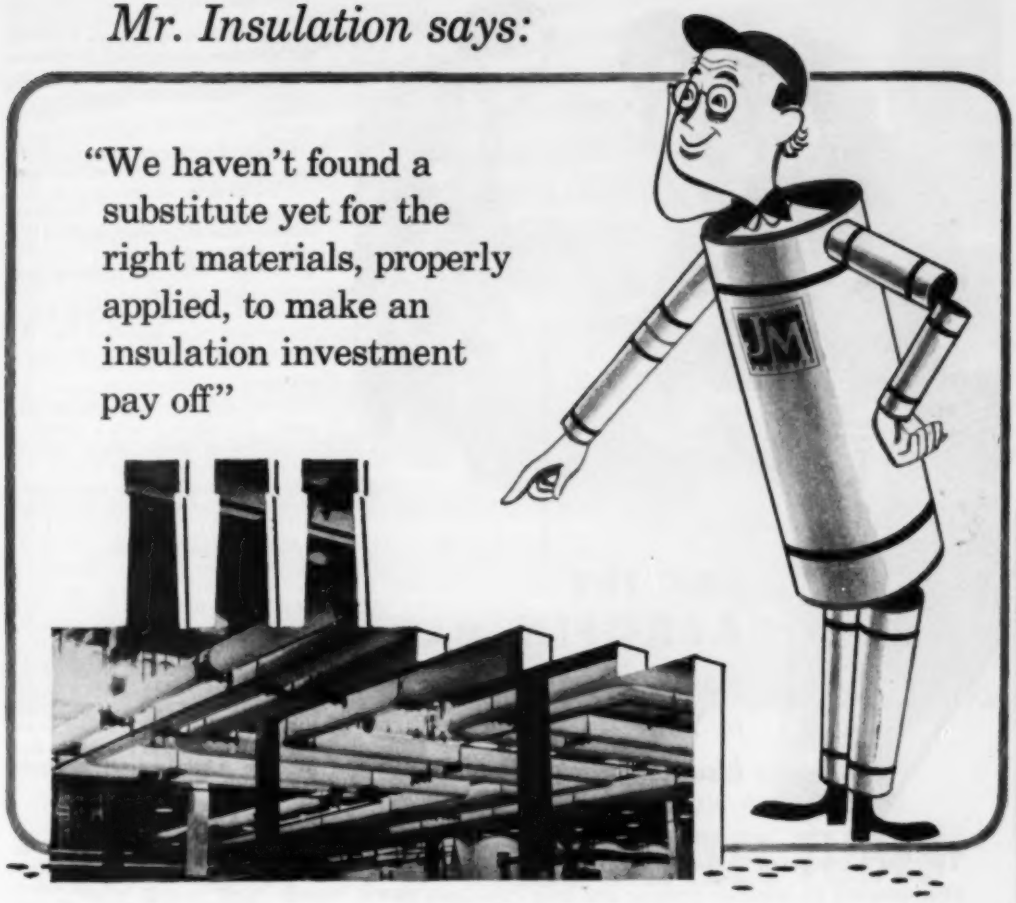
"Volume of manufacture and sales of the synthetic estrogens is small when compared with a bulk pharmaceutical such as aspirin." (p. 545)

"Writing ink consists essentially of a coloring matter dispersed in water." (p. 870)

Quotes from ECT Vol. 7 which show that you can prove anything with quotes unfairly lifted from context.

Mr. Insulation says:

"We haven't found a substitute yet for the right materials, properly applied, to make an insulation investment pay off"



To be successful an insulation job must be properly engineered. In addition, it must have these two important ingredients:

1... THE RIGHT MATERIALS: service conditions vary greatly in industrial applications. That's why no one insulation can serve as a jack-of-all-trades on all jobs. For this reason, Johns-Manville uses asbestos and many other selected raw materials to produce the most complete line of insulations available. These insulations serve applications ranging between the extreme temperatures of 400F below zero to 3000F above.

2... THE RIGHT APPLICATION: Here again Johns-Manville's long experience in the field of insulation can be of value to you. Insulation engineering advice plus the services of insulation contractors trained in Johns-Manville methods of correct application are at your call.

If you are planning an insulation job why not put your problem up to insulation headquarters? Write Johns-Manville, Box 290, New York 16, N. Y.

JM

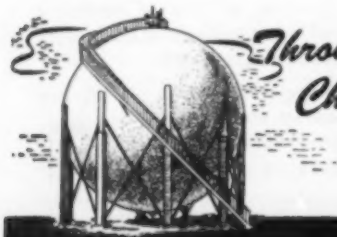
Johns-Manville *first in* **INSULATIONS**

ASK THE AEROFIN MAN

For the Practical Answer to Your Heat-Exchange Problem . . .

There is a competent Aerofin heat-transfer engineer near you, qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem.

This specialized knowledge is there, ready for you to use to your greatest advantage. Ask the Aerofin man — and be right.



Throughout the Chemical Industry —

Aerofin units do the job Better, Faster, Cheaper

AEROFIN CORPORATION 410 South Geddes St. Syracuse 1, N. Y.

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

Instrumentation, by Procopi, is a brief but adequate introduction to process variable measurement and control. Insulation concludes this group.

TRADES

Fur and fur processing occupies 10 pages with a vocabulary and facts that very few of us are concerned with. We just pay for the product. Glass is an industry that is represented in ECT by 32 pages of much theory and little technology. The third industry covered in this Vol. 7 is ice cream. This is another industry survey, but I find the product more important than the processes and techniques.

SUMMARY

There you have the meat from 982 pages. It is flavored with a reviewer's prejudices—as reviews always are. It is this bias, possibly, that accounts in part for my much greater appreciation of Vol. 6 (see Chem. Eng., *March 1951*, p. 261). The accident of the alphabet accounts for the rest. From FU to IO there were no subjects (or was it authors) that were as much pure fun to read.

Don't feel too bad. We will have more opportunities. In fact, I will go so far as to predict that there will be seven more. I'm sticking my neck out to say that there will be 14, not 12, books (plus an index) in the series. You know as much as I do about this. My guess is based on pure extrapolation.—*LBP*

British Viewpoint

CONTINUOUS PROCESSING OF FATS. By M. K. Schwitzer. Leonard Hill Ltd., London, England. 354 pages. 30 shillings.

American and European processes for treatment of fats and oils have been reviewed in some detail by the author. Pictures and flowsheets are liberally found throughout: The author's own sub-title, "A Chemical and Technological Survey of Present Trends in the Vegetable and Fish Oil Industries."

Some of the comments are inescapably tied to European economics. An occasional discrepancy in American technology is also noted. However, the book is profuse in its literature references and gives those who are studying fat technology many useful leads for further investigation.

Novel feature of the book, from the standpoint of U. S. technology, is the inclusion of two appendixes. One is on materials of construction used in the vegetable and fish oil industries, and the other is a list of representa-

(Continued)

SPECIALIZATION **GIVES YOU UNIFORM HIGH QUALITY IN**

GLOBE ALLOY STEEL TUBES

When you specify GLOBE you get the finest, because Globe *specializes* in the production of steel tubes. For more than thirty years Globe *specialized* research, engineering and manufacturing facilities have assured customers of uniform high quality in alloy steel tubes for pressure or mechanical applications.

GLOBE STEEL TUBES CO., Milwaukee 46, Wis.

Chicago • Cleveland • Detroit • New York • Philadelphia
St. Louis • Denver • San Francisco • Glendale, Cal.

Producers of Globe seamless stainless steel tubes — Gloweld welded stainless steel tubes — alloy — carbon — seamless steel tubes — Globeiron (high purity ingot iron) seamless tubes — Globe Welding Fittings.

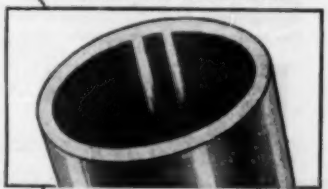
TYPICAL ANALYSES:

Carbon Moly.
1-¼ Chrome ½ Moly • 1-¾ Chrome ¾ Moly
2 Chrome ½ Moly • 2-¼ Chrome 1 Moly
5 Chrome ½ Moly • 7 Chrome ½ Moly
9 Chrome 1 Moly
A1S1 1335 • A1S1 2317 • A1S1 2512 •
A1S1 4130, 4140 • A1S1 4615 • A1S1 8615,
8620, 8630, 8635, 8640 • 7% Ni. • 9% Ni.

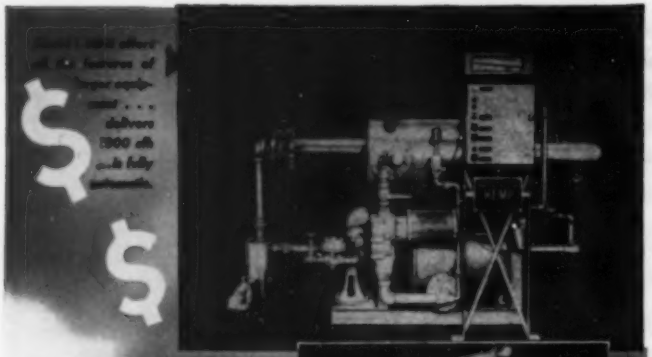
TYPICAL APPLICATIONS

Pressure Tubes — Superheater Tubes — Condenser Tubes — Still Tubes — Evaporator Tubes — Barrel Tubes — Oil-Well Pump Barrels — Mechanical Tubes — Aircraft Tubes—Rollers for Transmission Chains

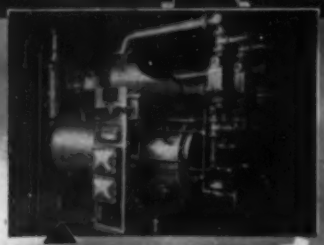
GLOBE SEAMLESS TUBES FOR MAXIMUM STRENGTH AND MINIMUM WEIGHT



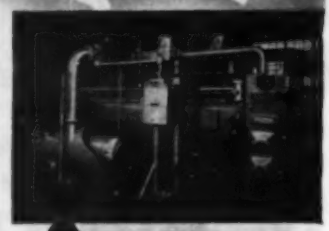
Pierced from solid steel billets . . . with no seams or welds. Globe seamless tubes are available in many sizes and wall thicknesses for exacting applications.



It pays to GENERATE your own INERTS



Model 6 MIE is ideal for agitating, bubbling and blanketing in synthetic resin plants . . . delivers 6000 cfh.



Model 60 MIE produces 60,000 cfh . . . is widely used for purging and blanketing in the petroleum industry.

Kemp Inert Gas Generators Save $9 of the $10 you now spend for Inerts

Need inerts for purging, fire protection, mixing, blanketing or a special application? You can save up to 90% on Inert Gas costs when you generate your own inerts with a Kemp Inert Gas Producer. The cost of transportation, bottle juggling, storage, deposits on cylinder inventories and the initial higher cost of bottled nitrogen or CO_2 is eliminated.

ABSOLUTELY DEPENDABLE

No matter what the demand, Kemp Inert Gas Generators give you the same analysis Inert Gas from 20% to 100% of capacity. The Kemp Industrial Carburetor, part of each installation, burns ordinary gas just as it comes from the mains. Assures complete combustion without "tinkering." Produces a clean, chemically inert gas to meet your most exacting requirements.

SEND FOR DATA

Whatever your requirements, always specify Kemp. *To find out how you can benefit:* Tell us your atmosphere gas problem, and we'll show you how Kemp can solve it and save you money!

KEMP OF BALTIMORE

INERT GAS GENERATORS

Write for Bulletin I-10 for technical information C. M. KEMP MFG. CO. 405 E. Oliver St., Baltimore 2, Md.

tive equipment manufacturers, principally European.

Despite its Continental atmosphere, or perhaps because of it, this book would be a desirable addition to any fats and oils library.—*GWM*

First Two Semesters

AN INTRODUCTION TO ORGANIC CHEMISTRY. Seventh edition. By Benjamin Harrow and Percy M. Apfelbaum. John Wiley & Sons, New York. 480 pages. $5.

Sections dealing with aliphatic chemistry—especially hydrocarbons—and with polymers have undergone extensive revisions to keep up with the intense activity in these fields since the publication of the sixth edition. However, the authors' emphasis has not shifted. They continue to feature the basic facts of organic chemistry while theory plays a supporting role, entering only when it may help the student explain the facts.

The book is meant to provide the first two semesters work not only for incipient organic chemists, but also doctors, dentists, pharmacists, biologists. Connecting links between organic chemistry and these other sciences are made clear in chapters on lipoids, nucleoproteins and their decomposition products, enzymes, vitamins and hormones.

Noteworthy student aids in this edition include: charts illustrating uses of important organic chemicals; a greatly increased number of cross references; an organized series of questions at the end of each chapter; an up-to-date list of references at the end of the book. —*FA*

More Technology

INDUSTRIAL OIL AND FAT PRODUCTS. Second edition. By Alton E. Bailey. Interscience Publishers, Inc., New York. 967 pages. $15.

This revised edition supersedes a six-year-old book that appears to have won a useful place on the reference shelf. The new edition is approximately 25 percent larger than the original, with most of the increase in the more useful categories of technology.

Although some of the production and consumption data of the first volume have been omitted, the book is still a little heavy with chemical and physical properties and theory. Much of that is helpful at times but in a new edition the author could well split his book into two volumes, one of which has the economics and statistics and perhaps the theories, with the other

volume devoted principally to the industrial know-how.

Examination of the tables of contents shows that the original very systematic organization of the book was followed. References are numerous throughout the book and this should be very helpful when additional details are desired. Author and subject indexes are also quite detailed.

The book is a little heavy on its tabular content, and a little light on its illustrations. In general though, this new second edition looks like a very good thing.—*GWM*

Three on Thermo

PRINCIPLES OF CHEMICAL THERMODYNAMICS. By Martin A. Paul. McGraw-Hill Book Co., New York. 740 pages. $7.50.

THERMODYNAMICS. Second edition. By George A. Hawkins. John Wiley & Sons, New York. 563 pages. $6.50.

BASIC THERMODYNAMICS. By Charles L. Brown. McGraw-Hill Book Co., New York. 266 pages. $4.50.

Reviewed by Ju Chin Chu

It is gratifying to see the publication of these three good books on thermodynamics. Although with the same title, "Thermodynamics," the three books are not in competition—they are written specifically for three groups: chemists, mechanical engineers, and engineers who can be satisfied with a one-semester course.

The first book, "Principles of Chemical Thermodynamics," is rather an extensive treatment. Although it is designed to extend the treatment of thermodynamics in elementary physical chemistry, the book can be used without prior knowledge in thermodynamics. The content of the text is presented in the following order: Temperature; First Law; Thermal behavior of simple systems; Thermochemistry; Second Law; Thermodynamic behavior of simple systems; Homogeneous systems; Chemical equilibrium; Galvanic cells; and Statistical molecular theory. Throughout the book the presentation of general principles is always followed by the applications specific in the field of chemistry. Home problems at the end of each chapter are especially valuable in illustrating the application of thermodynamics.

In addition to the above merits, the chapters on "Thermodynamics of Homogeneous Solutions" and "Statistical Molecular Theory of Thermodynamics" are most commendable.

(Continued)

• At one time the French Chamber of Deputies was debating women's suffrage. When one liberal soul pointed out that there was very little difference, after all, between the sexes, a fellow deputy leapt to his feet and shouted with gusto, *"Vive la difference!"*

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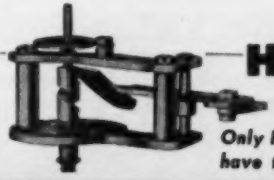

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BOOKSHELF, cont. . .

The presentation is so logical and the explanations have been so designed that the readers will find it easy to learn and to digest these two important topics in modern thermodynamics. For whomever is confused with Gibbs-Duhem's equation and its application, Dr. Paul's book is certainly a good reference. In the description thermodynamic of non-ideal solution, the discussion could be more complete by including the recent work of Redlich and Kister, especially for systems with association.

Professor Hawkins, in his 2nd Edition of "Thermodynamics" has retained his objective of providing a well-balanced text. The book is logically presented in the following order: Fundamental concepts; First Law; Three States; Ideal Gas; Equation of State; Gas Heat Capacity; Computing vapor properties by table; Reversible non-flow process; Second Law and its related subjects; Gas mixtures; Gas flow through nozzles and orifice; Ideal cycle of internal combustion engines; Air compressors and engines; Gas turbine and jet propulsion; Vapor cycles; mechanical refrigeration; General thermodynamic equations and introduction to heat transfer.

The book is recommended as a good text for undergraduate mechanical engineers. The theoretical presentations are supplemented by simple practical problems to illustrate the use of thermodynamics in professional engineering work. Instead of feeding undergraduate students with advanced material in thermodynamics, the book never goes beyond the limit of an elementary text and special emphasis is made to the correct use of units in the illustrative problems.

In "Thermodynamics" by Hougen & Watson, the authors defined "perfect gas" as ideal monatomic gas. This proposal has its logical basis and it might be worthwhile for the other authors, as well as Dr. Hawkins not to use "perfect gas" interchangeably with "ideal gas."

Compared with the first edition, in this second edition the chapters on First Law; Second Law; Second Law and Carnot Cycle; Available energy and unavailable energy; Entropy; Gaseous mixtures; Gas Flow through nozzle and orifice; and General thermodynamic equations have been completely revised. Minor changes have been made in the other chapters.

The third book, "Basic Thermodynamics" by Professor Brown is a text written for a one-semester course on mechanical application. The first part of the book deals with the two fundamental laws of thermodynamics and

(Continued)

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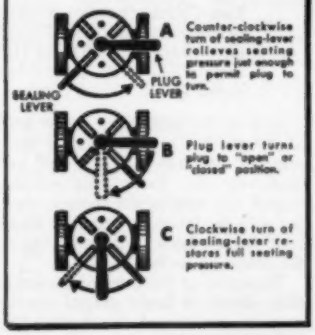
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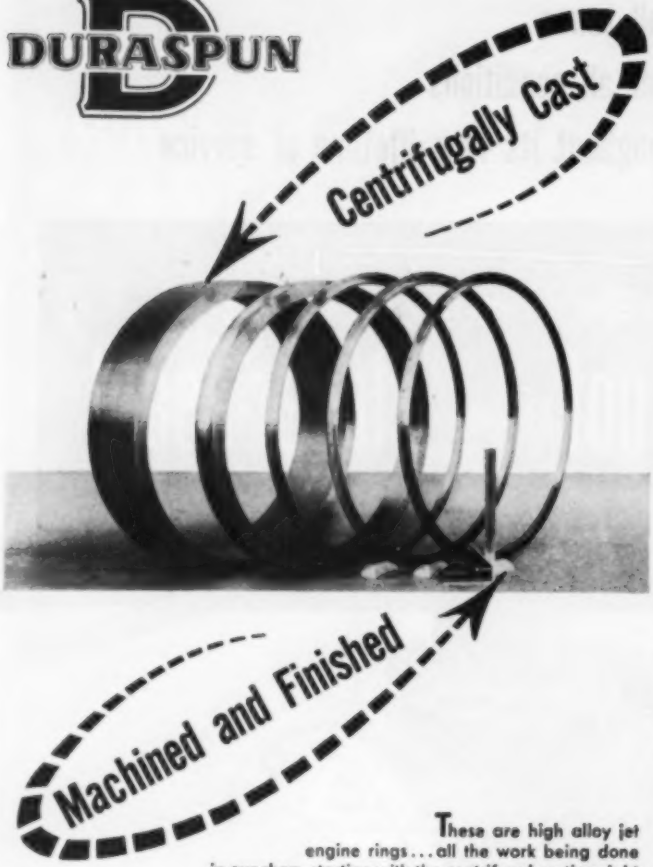

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their applications. For the lack of time in a single semester, the author omits the discussion for the non-flow process so that enough space can be devoted to the steady state flow process which is far more important in the mechanical engineering application. The devices or machines which operate on the simple principles of different power cycles are discussed in Chapter 7, "Heating and Cooling Devices," and Chapter 8, "Compressors, Pumps and Expanders." As one of the most important applications of thermodynamics, vapor power cycles and gas power cycles are carefully analyzed in the next two chapers. Refrigeration covers performance, vapor-compression refrigeration, vapor refrigerants, absorption and gas refrigeration. Although short, the chapter on refrigeration has rather extensive coverage as well as up-to-date treatment. In addition to the usual topics, such as energy and mass balance for nozzle, critical pressure, ideal converging-diverging nozzle calculations, nozzle friction and reversed nozzles, the author includes an excellent and comprehensive discussion on jet propulsion. Simple diagrams are given to aid the explanation. A brief introduction on heat transfer constitutes the last chapter of the book. Many numerical examples, as well as home problems, are designed to eliminate special formula substitution and to consider each problem by detailed analysis as a variant of a general case. The book has certainly fulfilled its purpose and the author is to be congratulated for his fine contribution.

Pesticides

THE CHEMISTRY AND ACTION OF INSECTICIDES. By Harold H. Shepard. McGraw-Hill Book Co., New York. 504 pages. $7.

One of the authorities in the field of insecticides has produced a book intended for both reference-shelf and classroom use. Insecticides are discussed in a very logical manner, starting with the inorganic materials which have longest been used and bringing the reader up-to-date.

Properties of the insecticides rather than details of insect control are the primary concern of the book. The author has tried to present the more essential facts and theories related to insecticides, including chemical, physical, and toxicologic aspects, with some historic and commercial information as well. Fungicides, rodenticides, and other pesticides are frequently mentioned.

Perhaps outstanding in the book is about 100 pages on synthetic organic insecticides. Approximately the same amount of space is also given to inorganic materials, to plant products, and to general aspects of chemical control.

Liberal use of original references, cited at the end of each chapter, comprise a very fine literature survey to the date of publication. Ten pages of appendix tables and about fifteen pages of subject index complete the volume.—*GWM*

Look, See, Act

THE ENGINEERING PROFESSION. Second Edition. By T. J. Hoover and J. C. L. Fish. Stanford University Press, Palo Alto. 486 pages, $7.50.
Reviewed by L. A. Monroe

A thought-provoking definition and description of engineering, the engineer and his characteristic systematic habit of thought. Stressed is the engineer's growing obligation to lend his viewpoint to industrial management and to community efforts for the general public welfare. The volume will interest the mature engineer planning, evaluating, coordinating his and his colleagues' activities, as well as young engineers, educators, vocational guides.

The engineer's training and aptitudes lead him into systematic impartial habits of mind—contrasted to the popular habit of reaching the answer by hunch or interest—to guide him in solving problems and in constructive work. The engineer must not merely look—he must see. To see requires thought and a nimble constructive imagination. But he must not only see; he must act. He thinks of his colleagues not as rivals, but as partners making joint contributions to the current objective. *(Continued)*

RECENT BOOKS RECEIVED

The Chemical Technology of Dyeing and Printing. Vol. II. By Louis Diserens. Reinhold. $12.

Industrial Piping. By C. T. Littleton. McGraw-Hill. $8.

Insect Control by Chemicals. By A. W. A. Brown. Wiley. $12.50.

Introduction to the Chemistry of the Silicones. 2nd ed. By Rochow. Wiley. $5.

The Pectic Substances. By Z. I. Kertesz. Interscience. $13.50.

Labelled Atoms. By R. Glascock. Interscience. $1.25.

Linear Computations. By P. S. Dwyer. Wiley. $6.

Physical Biochemistry. By H. B. Bull. Wiley. $5.75.

Radioactivity Applied to Chemistry. By A. C. Wahl & N. A. Bonner. Wiley. $7.50.

Textbook of Organic Chemistry. By C. R. Noller. Saunders. $5.75.

Thermodynamics of Irreversible Processes. By S. R. De Groot. Interscience. $4.

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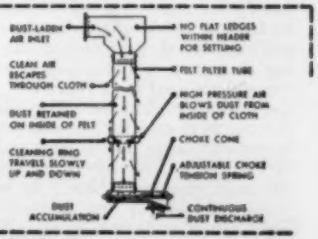
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Write-to-DAY for Bulletin 491

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Engineering is the art of application of science to the efficient utilization of resources. Engineering enterprises require full cooperation of the profession's fields—civil, mining, mechanical, electrical, chemical, and others. The concern with community welfare and his co-workers' well-being, developed in the engineer by his work, mark him in management fields not only for his systematic habits of thought, but also for his tendency to weigh community needs as factors in industrial problems, and to view the welfare of workers as vital in the conduct of an enterprise.

The various engineering fields are described, with activities of their members, and lists of past accomplishments, current problems, and needed research in each. Striking is chemical engineering's rapid growth and continual need for new personnel.

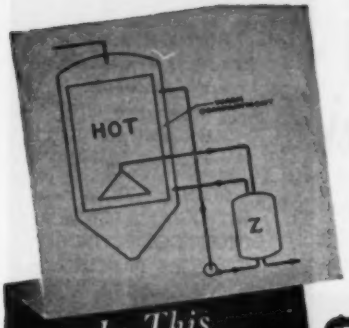
The engineering thought-method is successful, not because it is magical, but because it is "trained and organized common sense applied systematically." It is outlined as: (1) statement of problem; (2) evaluation of problem directly or by breakdown into factors, their evaluation and integration; (3) checking; (4) reporting. Numerous examples illustrate the method.

To the vocational guide, the engineer's basic aptitudes are stated as capacity to reason in mathematics, ability in chemistry and physics, active imagination, originality above average, industry—"the engineer like the physician is continually engaged in contest or in cooperation with nature, which carries on all the time"—intellectual honesty, loyalty to employer and to community and profession, manual dexterity, and rugged physique.

The new call to the engineer, as seen by the authors, is the obligation to lend to public affairs his factual and impartial thought-method weighing all factors including public welfare and the good of all concerned, in the reaching of decisions. They view the mental characteristic of engineers, to solve problems on the basis of all factors involved, as contrasting with the more common tendency to prejudge questions for later decision by legislative or managerial groups. The engineer's performance of his duty as a citizen, the authors feel, is his full participation as a citizen in community affairs. A vital obligation of the whole profession is stated as its active backing of the individual engineer devoting himself to his citizen-service in forwarding human progress. —*End*

Recent Books & Pamphlets

Subject	Summary	How to Order
Synthetic Fibers	A revolution is brewing as the chemical industry continues to come up with new fibers. Here's a progress report, classifying developments, evaluating their impact. Flowsheets accompany sections on: viscose rayon, cellulose acetate, nylon, polyacrylonitrile, acrylic copolymers, polyesters; more about vinyls, glass fibers, zeins. 8 pages.	Reprint No. 180, Editoria Dept., *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y. 25 cents.
Water	How much water was used from ground and surface sources last year and where—e.g. municipal, industrial, irrigation, power. Preliminary estimate. 13 pages.	"Estimated Use of Water in the U. S.—1950." By K. A. MacKichan. Circular 115, Geological Survey, Washington 25, D. C.
Instrumentation	Latest in electronic instrumentation including process control, new concept of automatic control, instrumentation of an ammonia plant—some of the subjects covered in the ten papers presented at a symposium for the process industries at Texas A & M. 64 pages.	"Instrumentation for the Process Industries." Instruments Publishing Co., 921 Ridge Ave., Pittsburgh 12, Pa. $2.50.
Pollution	Curbing losses of plating solutions and metals that otherwise might find their way into water courses—guidebook of principles and practice. Flow charts show three recovery systems. How operatings costs are cut. 20 pages.	"Plating-Room Controls for Pollution Abatement." Ohio River Valley Water Sanitation Commission, 414 Walnut St., Cincinnati 2, Ohio. 50 cents.
Coal Gasification	Method and equipment for making gas from coal by the Lurgi process—numerous diagrams and photographs. Since the process operates under pressure and the methane formed results in a manufactured gas of a higher heating value than that made in nonpressure processes, it seems most promising from a competitive standpoint. Curves and charts point up yields, test and performance data, analyses. 38 pages.	"Lurgi Process—Use for Complete Gasification of Coals with Steam and Oxygen under Pressure." By J. Cooperman. Bureau of Mines Bulletin 498. Superintendent of Documents, Washington 25, D. C. 45 cents.
Iodine	Table of physical properties of iodine and its inorganic compounds which covers more than 500 substances. 43 pages.	"Iodine Abstracts and Reviews." Vol. 2, No. 1. Chilean Iodine Educational Bureau, 120 Broadway, New York 5, N. Y. Gratis.
Rubber	Compilation of 100 widely used test methods and specifications. Some subjects and materials covered: processibility tests, chemical and physical tests of vulcanized rubber, packing materials, nonrigid plastics, rubber latices, latex foam, sponge and expanded cellular rubber. 656 pages.	"ASTM Standards on Rubber Products." American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $5.
Paint	In addition to paint, covers varnishes, lacquers, plastics, hot-applied bituminous products, and cement mortars. Cloth-bound.	"Paint Manual for Control of Paints and Painting." Superintendent of Documents, Washington 25, D. C. $1.25.
Defense	A new program for industrial dispersion designed to minimize effects of any atomic bombing attack on the U. S. 16 pages.	"Is Your Plant a Target?" Superintendent of Documents, Washington 25, D. C. 25 cents. —*End*



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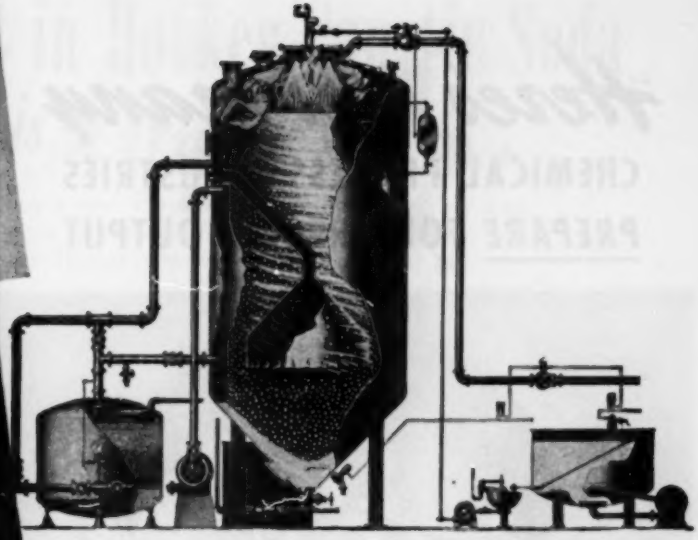

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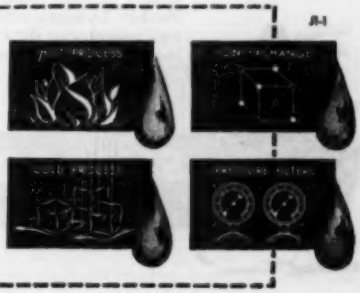

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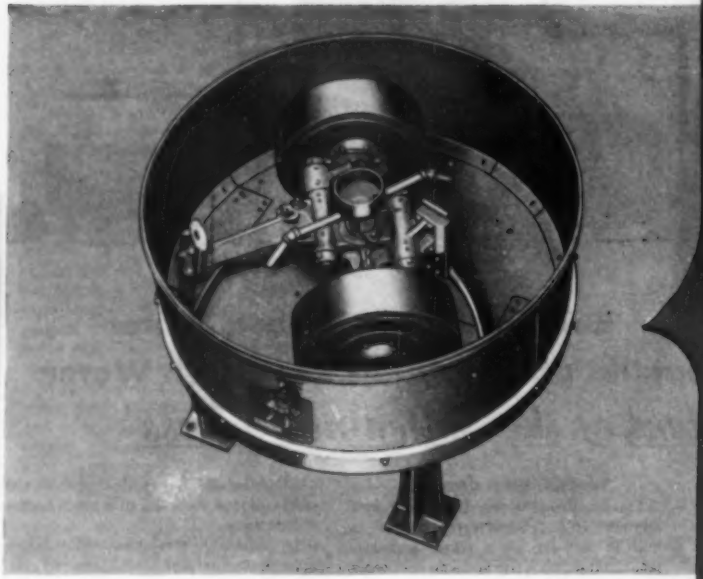

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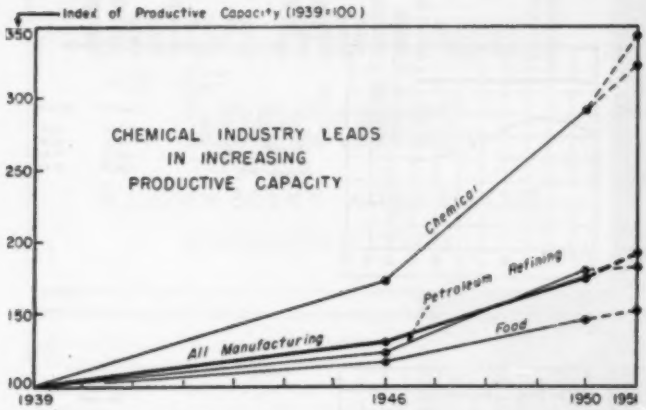


Expansion Rate Speeds Up

Chemical industry hikes its production goals as peace feelers fail to dampen plans for increasing capacity. Uncertain government policies cause little hesitation.

Nothing seems to dampen the expansion plans of the chemical industry—neither government regulations nor shortage of construction materials nor peace talks from Korea.

Chemicals are now ahead—far ahead—of all non-durable manufacturing lines in the race to expand productive capacity (see cut). This is shown by the midyear report of the President's Council of Economic Advisors.

At the beginning of the year, chemical producers indicated a desire to boost their capital expenditure by 143 percent as compared with 1950 (*Chem. Eng.*, April, p. 259), according to McGraw-Hill's fourth annual survey of business' plans for new plants and equipment.

Revised Upward: But how were these ambitious plans faring by midyear? Had the spate of government regulations checked the industry's plans for capital formation? What were the effects of the likelihood of shortages in some construction materials—especially structural steel—and the beginning of armistice talks in Korea?

A recent *Business Week* survey has now brought out the answers to these questions. It makes one thing clear: chemical businessmen have no intention of backing down on their previous estimates. Though half of the firms queried did revise their earlier estimates, in nearly all cases it was an upward revision.

According to one government source—the Securities & Exchange Commission—the volume of expansion in industry is so great that by the end of the year the capital expenditure total should hit an all-time high of $25 billion.

Basic Facts: There are two basic economic facts behind this strong expansion surge: (1) the impact of the defense program is now pushing production toward higher plateaus, and (2) demand prospects are bright.

True, certain lines are a bit wobbly now—textiles have had a mild slump, for example—but the long-run outlook is for high consumer incomes and a return to a high spending pattern.

Officials in the chemical industry say the profusion of new products is one of the big reasons behind their own expansion drive. The industry is highly competitive and the search for new products is a never-ending process.

Many chemicals—such as acrylonitrile and para-xylene for synthetic fibers and allethrin for insecticides—just can't be produced fast enough to satisfy the market. Synthetic detergents have become such a rage that phosphate demand has risen to a new peak. The $25 million that phosphate producers will spend for new plant and equipment in 1951 will be due in large part to the rise of the synthetic detergents.

So phenomenal has been chemical expansion during the past decade that the purchase of common stock in almost any company would have been a singularly rewarding act for an investor. Earnings after taxes of 19 representative chemical companies added up to $670 million in 1950, compared with $196 million in 1945 and but $210 million in the 1937 boom year. Despite the deeper tax bite, net earnings of 26 chemical companies for the first half of 1951 were up nearly 6 percent over the figures for last year.

The other side of the chemical growth picture, of course, is the vigorous step that the industry is taking to meet the demands of defense mobilization. Chemical needs multiplied so rapidly after Korea that several basic products—such as sulphur, soda ash and chlorine—are still in tight supply. Other hard-to-get items are benzene, methanol, ammonium sulphate, acetone and acetic acid. Though the situation has eased somewhat, the demand for formaldehyde, butyl alcohol, ethyl acetate, toluene and xylene is great.

Future Financing: It appears certain that retained earnings will be used to finance a considerable portion of capital expenditures for the chemical industries. Many companies—despite all the expansion since the end of World War II—have large sums of money on hand. In the period 1946-1950, for example, Du Pont had nearly $475 million in retained earnings and depreciation accruals.

These retained earnings—the basic source of capital expenditures—are the lifeblood of the chemical industry.

In those cases where retained earnings are insufficient to finance planned expansion, firms will turn to the private capital market. Union Carbide & Carbon has already borrowed $150 million and both Dow and Monsanto have indicated their intent to sell new securities.

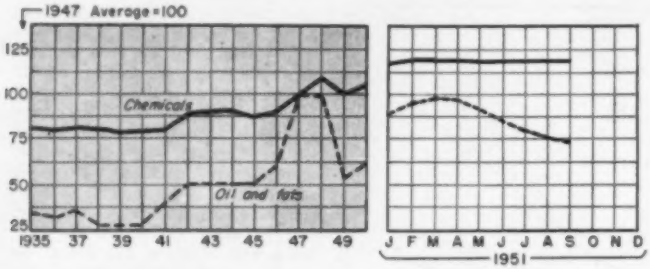
Clouds: There are two imponderables, however, which tend to cloud up the capital expenditures outlook for chemicals. These are government policies on the question of accelerated amortization and on the question of corporate taxes, especially the excess profits tax.

Only a few weeks ago Mobilization

(*Continued on page 373*)

Process Industry Trends

PRICES

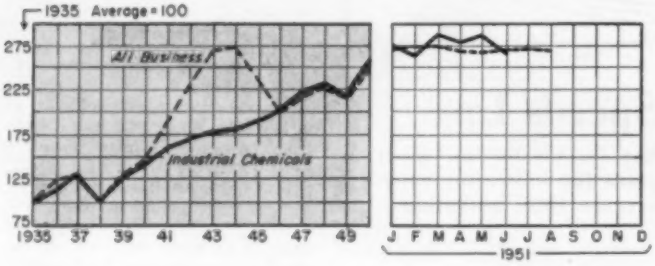


Chemical Engineering's Price Indexes

Chemicals – Down 0.11
Fats & Oils – Down 2.40

	Chemicals	Oils & Fats
As of Sept. 1	119.24	74.29
Last month	119.35	76.69
September 1950	107.85	71.46
September 1949	100.57	33.49

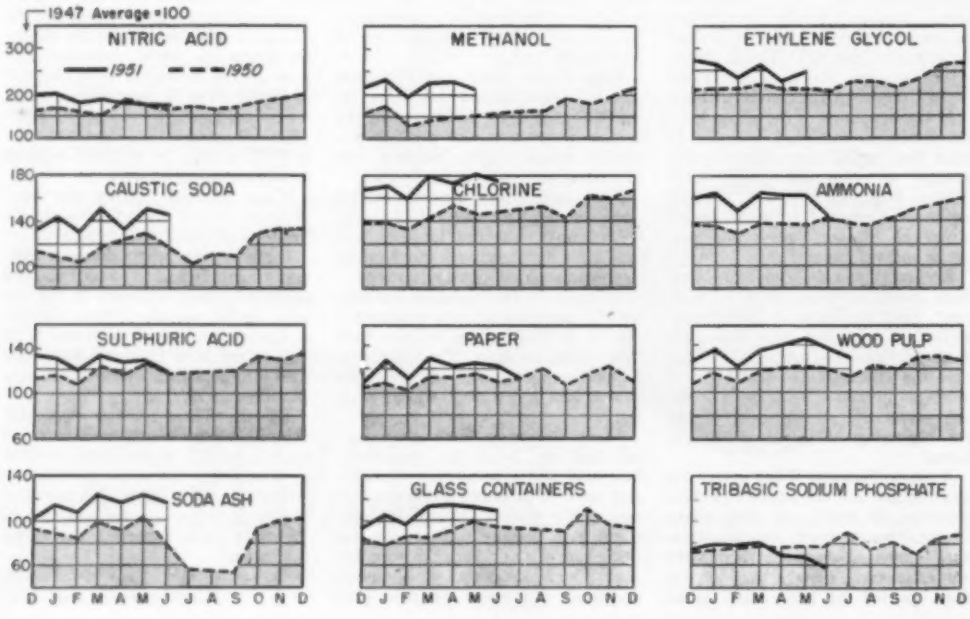
CONSUMPTION



Industrial Chemicals Index

	May (Revised)	June
Fertilizers	61.85	52.59
Pulp and paper	31.47	30.13
Petroleum refining	25.99	25.66
Iron and steel	16.68	15.87
Rayon	32.46	31.76
Glass	24.04	21.83
Paint and varnish	30.65	28.96
Textiles	12.86	11.77
Coal products	11.57	11.19
Leather	3.86	3.90
Explosives	9.12	8.76
Rubber	6.74	6.56
Plastics	18.95	17.70
INDEX	286.24	266.68

PRODUCTION



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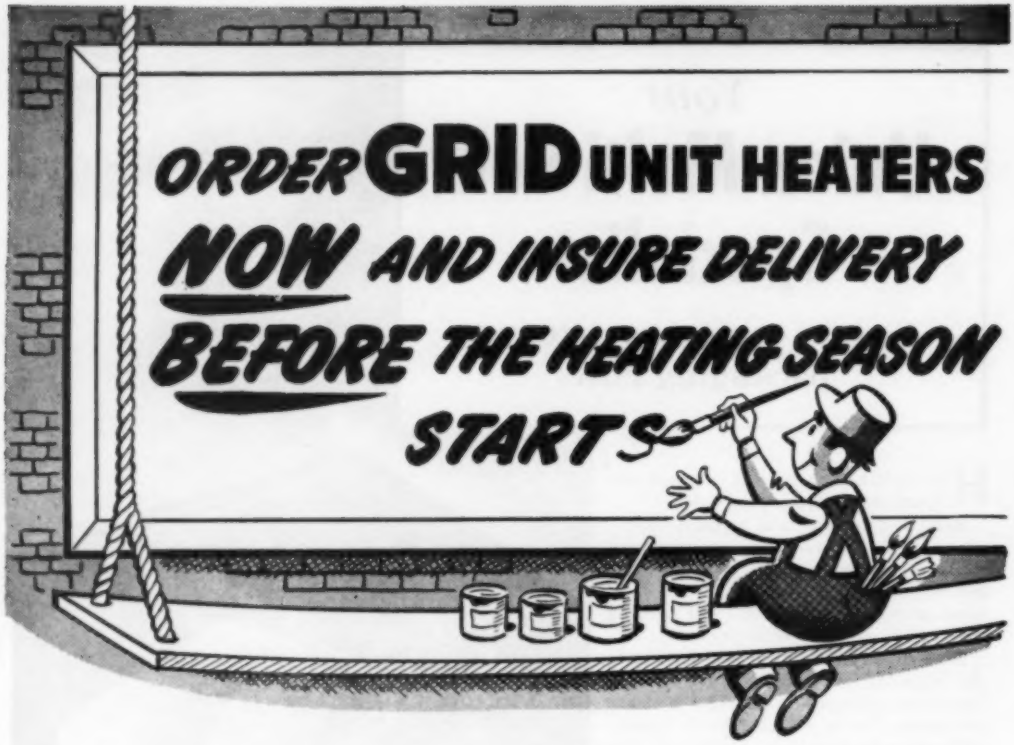

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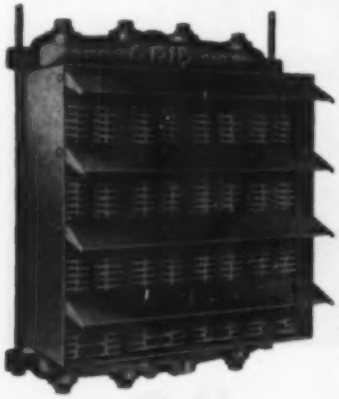

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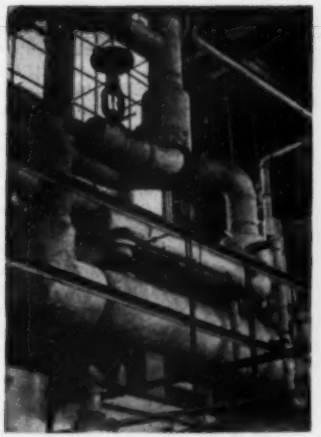

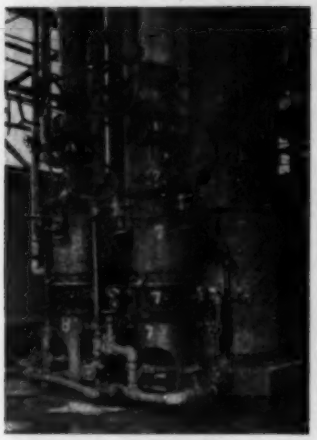

PLANT facilities may soon have to be expanded to meet demand for formaldehyde.

Why the Formaldehyde Boom?

Increasing plastics and adhesives demands and development of new uses are booming formaldehyde ahead; output may hit 1.5 billion pounds in the next two years.

ROGER WILLIAMS, JR., *president, Roger Williams, Inc., consulting chemical engineers, New York, N. Y.*

Simplest of the aldehydes, formaldehyde has already taken its place as a major chemical building block. Production has more than tripled since the beginning of World War II and is currently running double the peak of World War II demand. Production in 1951 will almost certainly pass the billion pound mark.

MARKETS: GROWING

The most important single factor in the great growth of the formaldehyde industry has been the rapid development of thermosetting resins.

Although many new and important uses for this material have been developed during the last 10-15 years, the phenolic, urea and melamine plastics still constitute the backbone of formaldehyde consumption. Despite the fact that these resins are the oldest in the thermosetting field, they also contribute largely to the expanding demand for formaldehyde through continual new developments. One of the important factors in this respect has been the improvement and specialization of molding powders through modification with other materials; new molding techniques have also greatly expanded the scope of the industry.

Among the more important new developments during the last 10 years for condensation products have been phenolic, urea and resorcinol adhesives for the plywood and furniture industries. Adhesives applications are to the urea resin producers what molding powders are to the phenol-formaldehyde manufacturers.

Synthetic glues are not confined to plywood and laminates; these resins have also led to extensive developments in the use of wood waste, sawdust and wood chips for conversion into wallboard. Another striking example of the use of a modified phenolic adhesive is the all-wood laminated Unicel box car, now going into production.

In the urea resin field, a major development has been the impregnation of textiles to give crease-resistant and waterproofing characteristics.

Modern technology is continuing to develop many new demands for the thermosetting resin industry and new modifications of established basic resins open up many fields as yet unexplored.

The other three major formaldehyde derivatives are of more recent origin. Ethylene glycol is manufactured in large volume by Du Pont, employing a unique process through glycollic (hydroxyacetic) acid.

Hexamine has a comparatively limited demand based upon its use in the production of "2-stage" phenolic resins; however, under a defense economy its demand is greatly increased as an intermediate for the explosive RDX, which was developed during World War II.

The third derivative, pentaerythritol, is probably the most important from the standpoint of both a peace time and emergency-type economy. Pentaerythritol (PE) has two outstanding applications: as a resin raw material and as an explosive.

This condensation product of formaldehyde and acetaldehyde has become, since the war, one of the outstanding raw materials for alkyd type resins and is widely used in the protective coating field. While it possesses unique properties in its own right, PE is also invaluable in a defense economy as a replacement for glycerin. In a defense economy, PE type resins are not only widely used by the armed services for protective coatings, but PE was an important explosive intermediate during the last war.

Other recent developments in formaldehyde include its use, usually as a paraformaldehyde, as a component in drilling muds in the oil fields and also, in the form of a cresol resin, to prevent the caving-in of oil-bearing sands at the well bottom.

Lesser applications are mainly as an

(Continued)

Producers: Who, Where, How Much

Producer	Location	Capacity, Million Lb.
Bakelite	Bound Brook, N. J.	140
Borden	Springfield, Ore.	28
	Bainbridge, N. Y.	12
	Demopolis, Ala.	20*
Celanese	Bishop, Tex.	180
Cities Service	Tallant, Okla.	22
Commercial Solvents	Agnew, Calif.	8
Du Pont	Belle, W. Va.	175
	Perth Amboy, N. J.	150
	Toledo, Ohio	60
Durez	Tonawanda, N. Y.	30
Heyden	Garfield, N. J.	170
	Perth, N. J.	90
Kay-Fries	W. Haverstraw, N. J.	15
Monsanto	Indian Orchard, Mass.	85
Rohm & Haas	Bristol, Pa.	25
	Bridesburg, Pa.	25
Solvay	So. Point, Ohio	45
Spencer Chemical	Calumet City, Ill.	35
Watson-Park	Ballard Vale, Mass.	15
Total		1,200

*For 1952.

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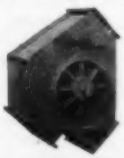

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intermediate for textile treatment compounds such as the sulphoxalates; detergents, fire-retardant paints and other specialized and small volume requirements.

One of the most interesting requirements for formaldehyde may come as an intermediate in the development of acetylene chemistry. It is, as yet, too soon to predict any possible volume, but great possibilities exist for eventual developments along these lines.

Comparison of the total capacity now available with the end use requirements for 1951 indicates very little margin for increased demand. There is, however, no doubt that a shortage of formaldehyde does exist and that it will increase; a conservative estimate would probably place the annual formaldehyde demand at around 1.5 billion pounds within the next two years. This figure may well be low.

PROCESSES: COMPETITIVE

Little has been published on the details of the processes for producing formaldehyde. Basically, however, they fall into two categories, based on the raw material. First, from a chronological standpoint, is the oxidation of methanol; second is the oxidation of natural gas or C_3, C_2 or C_4 hydrocarbons.

Processes based on methanol can be further divided into those which use silver, copper or platinum catalysts and those which use an iron-molybdenum catalyst.

In any of these cases, the problem is to partially oxidize the raw material with air and yet not allow the oxidation to be carried to completion—to carbon dioxide and water. Then the explosive limits are such that the operation must be carried out with an excess of air or raw material.

The most common process for formaldehyde production is oxidation of methanol with air over a silver gauze catalyst. Perhaps the only plant description of such a unit was given by Olive in *Chemical Engineering* (Feb. 1949, pp. 130 and 146). Here the air-methanol ratio is operated with excess methanol to avoid the explosive limits. The mixture is heated to about 85 deg. C. and is passed through the

1951 Requirements

For	Million Lb.
Phenolic resins	330
Urea resins	310
Melamine resins	120
Pentaerythritol	210
Hexamine	90
Paraformaldehyde	22
Ethylene glycol	150
Textile treatment & Textile chemicals	25
Miscellaneous	25
Total	1,282

Production, Sales & Value

	Production, Lb.	Sales, Lb.	Sales Value
1939.....	134,478,000	91,160,000	$4,061,000
1940.....	190,684,000	107,969,000	$4,559,000
1941.....	309,912,000	102,034,000	$6,762,000
1942.....	347,463,000	221,887,000	$9,401,000
1943.....	522,920,000	243,360,000	$9,806,000
1944.....	522,440,000	344,902,000	$12,889,000
1945.....	423,588,000	282,051,000	$9,228,000
1946.....	458,827,000	341,507,000	$10,570,000
1947.....	520,642,000	388,389,000	$13,908,000
1948.....	617,187,000	418,253,000	$15,311,000
1949.....	549,744,000	331,439,000	$9,991,000
1950.....	835,142,000	509,419,000	$16,048,000

From U. S. Tariff Commission.

converter. These are small units packed with layers of silver gauze and equipped with internal water coolers. They operate at about 635 deg. C.

Gases from the converter, containing formaldehyde, nitrogen, unreacted methanol, and small quantities of carbon monoxide, formic acid, hydrogen and water, then are quenched in an absorber. By passing the gas through two absorbers the formaldehyde, methanol and formic acid are absorbed and the remaining gases are vented to atmosphere.

It should be noted that even trace quantities of formaldehyde in the atmosphere are objectionable, so many plants operate the entire process under vacuum to avoid leaks.

In the case of the silver-gauze process, the liquid leaving the base of the absorber is fractionated to recover a heads consisting of about 99 percent methanol and a tails of just over 37.5 percent formaldehyde and 1 percent methanol. The latter is then adjusted by addition of water to 37.5 percent formaldehyde (commonly called formalin). The methanol heads are then recycled to the converter.

Formalin produced by this process usually contains too high a proportion of formic acid for most applications. This is usually removed by passing the product through beds of ion exchange resins. Occasionally the product is also passed through activated carbon for clarification.

The process using iron-molybdenum catalysts has only been described briefly in the literature. The process differs in several respects. In the first place, the catalyst is powdered or is impregnated on a catalyst support. This means that the reactors tend to consist of small tubes surrounded by a heat transfer medium. Furthermore, it is reported that this process operates with excess air, rather than methanol, so that there is essentially no methanol in the absorber liquid. This eliminates the distillation step. Formic acid may be present, however.

Processes involving oxidation of methane, ethane, propane, and butane face similar problems with those of methanol oxidation. There has been very little published on these except

(Continued)

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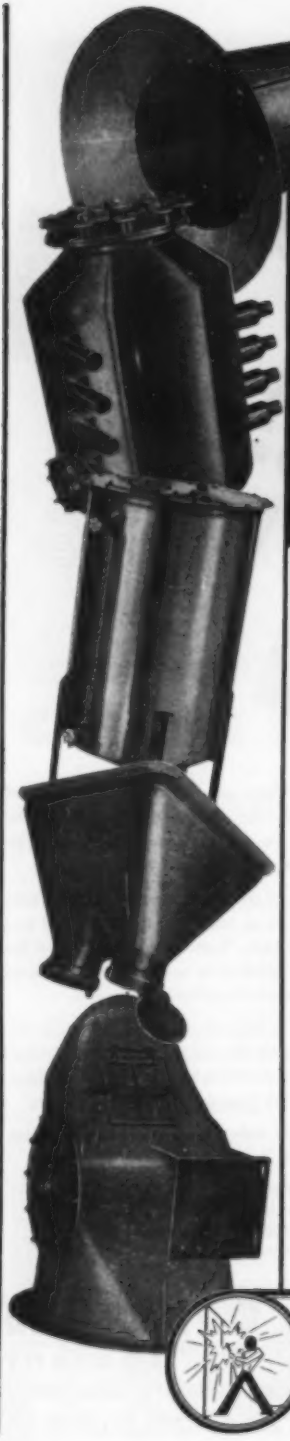

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patents. In general, they involve oxidation with an excess of hydrocarbon to maintain insofar as possible the desired partial oxidation. Sometimes pressures above atmospheric are used.

Major problem in these processes, which aim for production of methanol and acetaldehyde as well as formaldehyde, is to quench the reaction promptly. Hence, although there has been practically nothing published on engineering details, it would appear probable that the converters consist of multi-tubular units surrounded with a heat transfer medium such as Dowtherm or HTS. The exit gas from the converters would then be immediately quenched in an absorber. Contact times over the catalyst bed are on the order of 0.5 sec. or less.

A varying range of products comes from this type of oxidation, depending on operating conditions, catalyst and raw material. Among those which have been reported are acetaldehyde, acetone, methanol, propanol, butanol, formaldehyde, propionic and acetic acids.

Net result is that the various producers are somewhat limited in the amount of various products they can produce. If formaldehyde demand is high, and acetaldehyde demand low, the producer may have a problem in meeting the one demand without a disposal problem on the other product. This problem has been minimized by development of more selective catalysts which have limited the number of products made by a given plant, and by development of flexibility in operating conditions which have resulted in greater flexibility in product ratios.

PROCESS ECONOMICS

There have been two recent trends in formaldehyde production, both influenced by economic factors.

First, the demand for such products as acetaldehyde and acetone has led to an increase in the proportion of formaldehyde produced by the hydrocarbon oxidation route. Here large central plants are involved, so shipping costs have led to the development of solid paraformaldehyde to minimize the necessity of shipping the water in 37.5 percent solutions long distances.

The second factor, opposed to the above, has been the construction of small, captive, methanol-oxidation plants. Such units avoid the high transportation cost factor. Moreover, the silver-gauze type units appear ideally suited for the installation of relatively small plants. Further development of this trend would appear likely. —End

Director Charles E. Wilson declared a 60-day moratorium on the issuance of government permits for five year accelerated amortization of plant costs. During this two month period, the whole policy of providing incentives for capital formation through fast write-offs will be reviewed—and possibly recast.

Accelerated amortization has been a significant factor in chemicals. To date, requests for over $525 million of new facilities—involving more than 150 plants—have been validated. If amortization policy is de-liberalized, it would certainly have a depressing effect on plant expansion. The effect, however, would tend to be more severe the less certain businessmen were of their prospects after the period of mobilization.

But the chemical industry is growing in response to both present and future needs. There will be plenty of expansion for which accelerated amortization will never be requested. And even if a request should be turned down, that does not necessarily mean that the suggested expansion will be deferred.

Uncertain Tax Policy: As matters stand now, future tax policy is uncertain. The Congressional docket is so jammed that it may take until October to pass a new revenue act. The House has passed a bill which would raise taxes on all corporate income, including excess profits, by 5 percentage points retroactive to January 1.

In addition to raising the rate of the excess profits tax from 77 to 82 percent, the average earnings credit for this particular tax was reduced from 85 to 75 percent of the pre-Korea base period.

Past experience has shown that an excess profits tax tends to dull a corporation's drive for increased efficiency and expanded output. This happens because the tax is, in effect, a penalty against growing and risk-taking firms which have earned a reward consistent with their contribution to the national welfare. The House version would practically confiscate 25 percent of a company's prewar earnings; it is therefore more truly a high profits tax than a tax on excess profits.

Next Few Years: In the case of chemicals, however, the forces making for growth are so strong that it is doubtful if even unwise government policy can stifle expansion.

Capital expenditures in chemicals are almost certain to continue rising during the next few years. The chemical industry is still a growth industry.

—End

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New Construction

Proposed Work

Ala., Huntsville—Courtaulds, Inc., c/o Lustre Fiber, 600 5th Ave., New York, N. Y., and 16 St. Martins-le-Grand, London, England, plans to construct a rayon manufacturing plant here. Estimated cost $10,829,000

Ill., Tuscola—National Petro-Chemical Corp., Tuscola, plans to construct a plant to extract butane, propane, ethyl chloride from piped in natural gas company formed by Panhandle Eastern Pipe Line Co. and National Distillers Products. Estimated cost $38,000,000

Kan., Arkansas City—Kanotex Refining Co., C. M. Boyle, Pres., plans to construct a refinery. Estimated cost $2,300,000

O., Lockland—The Formica Co., 4620 Spring Grove Ave., Cincinnati, manufacturer of laminated plastics, plans to construct a factory, warehouse, boiler plant, etc. A. M. Kinney, 2950 Vernon Pl., Cincinnati, Archt. and Cons. Engr. Estimated cost $7,900,000

O., Maple Grove—Basic Refractories, Inc., Maple Grove, plans to construct a factory to produce dolomitic refractory materials. Estimated cost $3,500,000

Okla., Fairview—Warren Petroleum Corp., Tulsa, plans to construct a propane producing gas plant in Major Co. Estimated cost $1,585,570

Okla., Pryor—Coronado Manufacturing Co., Pryor, plans to construct a paper board factory. Estimated cost $3,000,000

Pa., Pottstown—Firestone Tire & Rubber Co., Pottstown, plans to construct a factory, warehouse and office building. Day & Zimmerman, Inc., 1700 Sansome St., Philadelphia, Cons. Engr. Estimated cost $5,500,000

Tex., Clarkwood—Celanese Corp. of America, Clarkwood, plans to construct a laboratory. Smyth & Smyth, Archts. and W. Wild, Assoc., Archt., Gulf Security Bldg., Corpus Christi. Estimated cost $400,000

Tex., Dallas—Diamond Alkali Co., Lamar and Lenway Sts., plans to enlarge its silicate of soda plant. Estimated cost $750,000

Tex., Houston—Eastern States Petroleum Co., Inc., Ship Channel, plans to construct a plant for the production of various grades of gasoline. Estimated cost $3,300,000

Utah, Salt Lake City—Carter Oil Co., Natl. Bank of Tulsa Bldg., Tulsa, Okla., plans to construct an oil refinery here. Estimated cost $1,000,000

Contracts Awarded

Fla., Fernandina—Rayonier Corp., Fernandina, will construct an addition to its paper and pulp plant. Work will be done with own forces. Estimated cost $2,985,535

Fla., Port St. Joe—St. Joe Paper Co., Port St. Joe, has awarded the contract for expanding its paper mill to Tidewater Construction Co., 538 Front St., Norfolk, Va. Estimated cost $25,000,000

Ill., Chicago—Container Corp. of America, 38 South Dearborn St., has awarded the contract for a paper manufacturing plant to Sherman Olson Co., 600 West Jackson St., Chicago. Estimated cost $500,000

Ill., Chicago—Southern Cotton Oil Co., 4401 West 31st St., has awarded the contract for refinery buildings to Austin Co., 510 North Dearborn St., Chicago. Estimated cost $6,000,000

Ill., Chicago—Sovereign Oil Co., 6051 South Knox St., has awarded the contract for a canning and blending plant to Charles T. Houha Construction Co., 818 Harrison St., Oak Park. Estimated cost $95,000

Ind., Mishawaka—U. S. Rubber Co., 1230 Avenue of the Americas, New York, N. Y., has awarded the contract for a power plant at its plant here to John Griffiths & Son, 228 North LaSalle St., Chicago, Ill. Estimated cost $3,500,000

La., Baton Rouge—Allied Chemical & Dye Corp., Solvay Process Div., 61 Bway., New York, N. Y., has awarded the contract for additions to its soda ash plant here to J. G. White Engineering Corp., 80 Broad St., New York, N. Y. Estimated cost $15,000,000

La., Monroe—Brown Paper Mill c/o Morton C. Tuttle Construction Co., 962 Park Sq. Bldg., Boston, Mass., contractor, will construct an addition to its mill here. Estimated cost $3,200,000

Mass., Worcester—Astra Pharmaceutical Products, Inc., 332 Main St., has awarded the contract for a laboratory and office building to Francis Harvey & Sons, Inc., 141 Dewey St. Estimated cost $82,000

Mich., Detroit—Climax Molybdenum Co. of Michigan, 624 Fisher Bldg., has awarded the contract for a 1 story addition to its plant to Alfred A. Smith, 721 East Saratoga St., Ferndale. Estimated cost $125,000

N. J., Edgewater—Allied Chemical & Dye Corp., Barrett Div., 40 Rector St., New York, N. Y., has awarded the contract for an applications research laboratory to H. K. Ferguson Co., 19 Rector St., New York, N. Y. Estimated cost $500,000

Ohio, Akron—B. F. Goodrich Co., Main St., has awarded the contract for a boiler for its main power house to Carmichael Construction Co., 148 East Miller St., Akron. Estimated cost $600,000

	Current Projects		Cumulative 1951	
	Proposed Work	Contracts	Proposed Work	Contracts
New England	.....	$82,000	.....	$5,247,000
Middle Atlantic	$5,500,000	4,037,000	$20,800,000	68,495,000
South	10,829,000	54,936,000	172,140,000	301,085,000
Middle West	49,400,000	10,902,000	120,809,000	136,937,000
West of Mississippi	11,336,000	1,150,000	275,563,000	345,958,000
Far West	1,000,000	.....	37,096,000	63,435,000
Canada	.....	.....	152,012,000	109,244,000
Total	$78,065,000	$71,107,000	$778,718,000	$1,030,401,000

Pa., Bridgeville—American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y., has awarded the contract for alterations and additions to its chemical plant here to Rust Engineering Co., Rust Bldg., Pittsburgh. Estimated cost $3,000,000

Pa., New Castle—New Castle Refractories Co., New Castle, has awarded the contract for an addition to its plant to Matthew Leivo & Sons, Inc., 180 Nassau St., Princeton, N. J. Estimated cost $208,939

Pa., Oaks—Synthane Corp., Oaks, has awarded the contract for a plant addition to E. R. Kutz, Montgomery Trust Arcade, Norristown. Estimated cost $118,200

Pa., Zelionople—Johns-Manville Corp., Zelionople, will construct a plant for the manufacture of fire brick. Work will be done by owner. Estimated cost $210,000

S. C., Harleyville—Carolina Giant Cement Co., 117 South 17th St., Philadelphia, has awarded the contract for a cement plant to MacDonald Engineering Co., 188 West Randolph St., Chicago. Estimated cost $4,600,000

Tenn., Memphis—Missouri Farmers Assn., Columbia, Mo., has awarded the contract for a catalytic cracking plant, including storage tanks for 3,000,000 gal. gas, at Delta Refining Plant, to Koch Engineering Co., 335 West Lewis St., Wichita, Kan. Estimated cost $1,800,000

Tex., Fort Worth—Premier Petroleum Co., Mt. Olivet Rd., will construct a refinery addition. Work will be done with own forces. Estimated cost $375,000

Tex., Longview—Skelly Oil Co., Longview, has awarded the contract for an additional refining unit for special refining to Universal Oil Products Co., c/o owners. Estimated cost $775,000

W. Va., Natrium—Southern Alkali Corp., c/o Pittsburgh Plate Glass Co., 4337 5th Ave., Pittsburgh, Pa., has awarded the contract for cell and evaporator buildings at its plant here to McCloskey Co., Liberty and Denny Sts., Pittsburgh. Estimated cost $2,000,000

W. Va., South Charleston—West Vaco Chemical Corp., South Charleston, has awarded the contract for a laboratory to Kenhill Construction Co., 215 Sherridan Circle, Fort Hill, Charleston. Estimated cost $350,000

Wis., Oshkosh—Hoffmaster Paper Co., Oshkosh, has awarded the contract for a 1 story, 101x146 ft. warehouse to C. R. Meyer & Sons Co., 50 State St.

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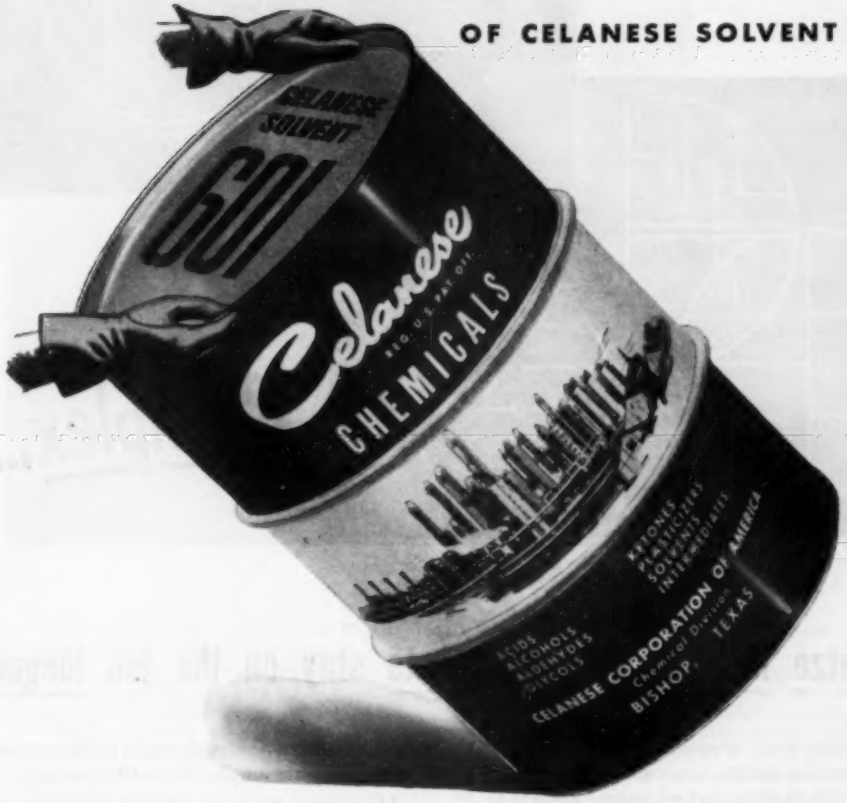
PERFORMANCE RECORD AND PRODUCTION ECONOMY

OF CELANESE SOLVENT 601



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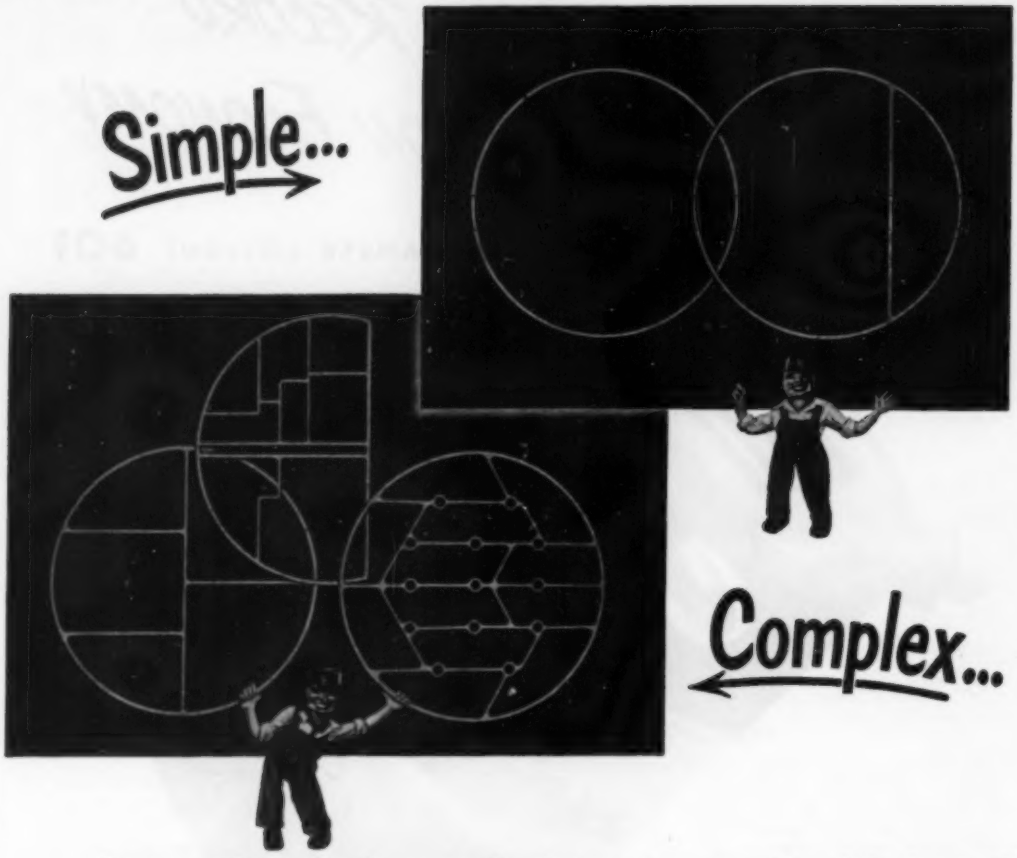

Goetze Heat Exchanger Gaskets stay on the job longer!

Whether your specifications call for a simple or complex design, you can depend on Johns-Manville Goetze heat exchanger gaskets to do the kind of sealing job that costs you less in the long run!

That's because they are carefully hand-tailored to assure the accuracy of fit so important in heat exchanger service. Every detail of construction reflects the craftsmanship that goes into the fabrication of these better gaskets. You'll find no wrinkles or cracks on the corners. Lap widths are ample, rib widths uniform.

More than 60 years of gasket-making experience is your further assurance that when you put a Goetze heat exchanger gasket on the job, you can count on it to *stay* on the job for a long time. For further details and a prompt estimate of cost, send us a blueprint or template. Just address Johns-Manville, Box 290, New York 16, New York.

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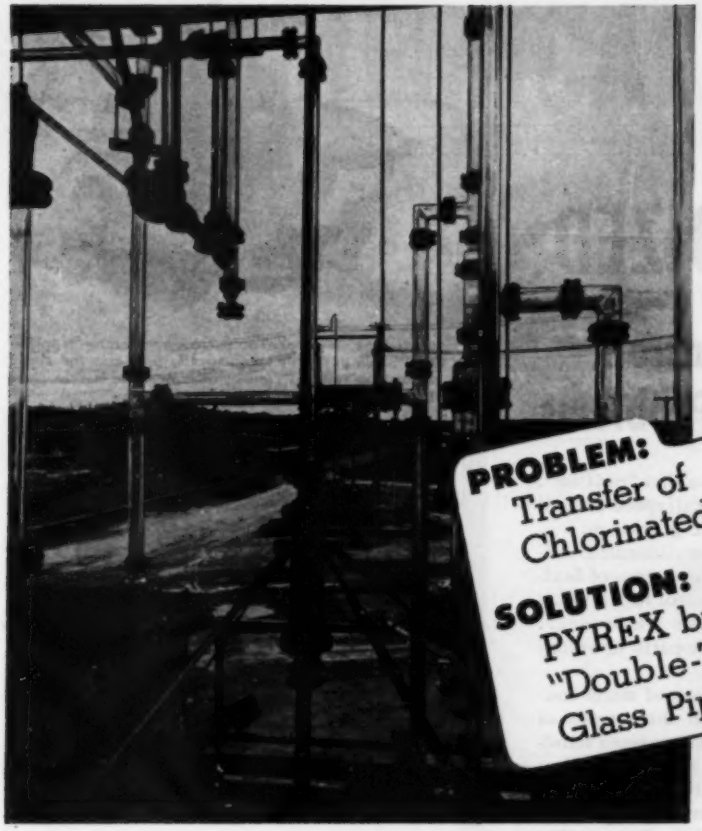

HERCULES POWDER COMPANY
Parlin, N. J.

Here's another typical example of PYREX brand "Double-Tough" Glass Pipe at work — doing an important job for Hercules Powder Co. The glass pipe, pictured above, is used for transferring highly corrosive chlorinated liquids at Parlin, N. J.

Highly resistant to every acid except hydrofluoric . . . as well as many alkalies . . . PYREX brand glass pipe has proven entirely practical for handling corrosive solutions. Chemically stable, it will not contaminate even the most sensitive products. Its remarkable ability to withstand rapid temperature change permits instant switching from hot to cold solutions. Highly resistant to mechanical shock and unaffected by weathering, PYREX brand glass pipe is practical for both inside and outside use.

You'll find the transparency of glass pipe another big advantage. You can keep an eye on the flow, catch sedimentation, crystallization, or discoloration of liquids at a glance — before any real harm is done. What's more, PYREX brand glass pipe is as economical as any corrosion resistant material on the market today. Easy to install and maintain — your own help can do the job. It's a time tested plant material *available now through strategically located distributors*. For your copy of the PYREX brand "Double-Tough" Glass Pipe Catalog, mail the coupon today.

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Costly special engineering is eliminated. Advanced design gives an unusual degree of flexibility... with precise speed control for all steam conditions. Results? Initial costs are lower... shipments are quicker... spare-parts inventory is reduced.

Designs for three basic classes of steam conditions, three wheel sizes, and three types of governors provide, in effect, twenty-seven standard variations to cover a wide range of applications. All oil-governed, direct-connected Type E units include the standard reservoir-type base, as illustrated. What's more, Type E governors can meet a great number of special requirements with optional accessories. This standardization results directly from Westinghouse's wide experience in all industry.

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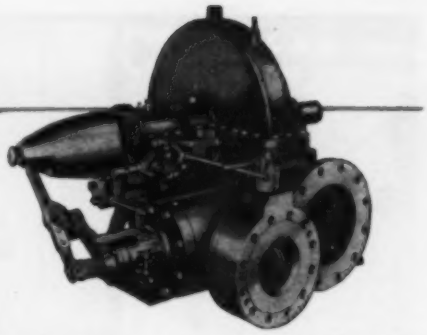
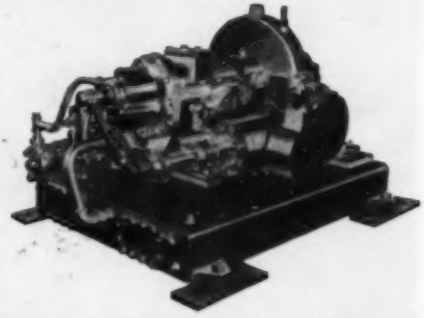
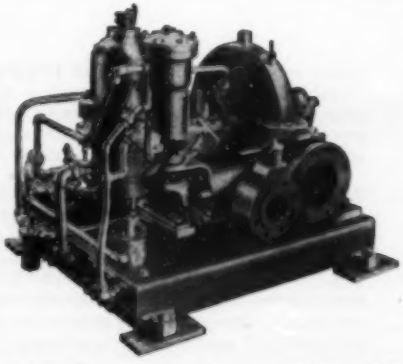


Shaft-Type Governor. For narrow speed-range applications, this governor automatically positions the steam admission valve to control turbine speed within close limits—*6 to 8% speed regulation.*



Hydraulic-Orifice Governor. For wide speed-range applications such as drives for fans, blowers, and compressors —*3-to-1 speed-adjustment range; 6% speed regulation.*



Vertical Oil-Relay Governor. For narrow-range precision-control applications such as drives for generators, pumps, blowers and compressors—*33⅓% speed-adjustment range; 4% speed regulation.*

J-50527

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U.S.I. CHEMICAL NEWS

September ★ A Monthly Series for Chemists and Executives of the Solvents and Chemical Consuming Industries ★ 1951

Intravenous Alcohol Good General Pain-Killer

Favorable results have been reported in 2000 cases where alcohol-water solutions were injected intravenously to relieve pain. Doctors state that patients have no "doped" feeling, but rather a sense of well being.

The physicians anticipate that it may be possible to eliminate entirely the use of opiates and other sedatives in postsurgical cases by steady injection of an alcohol-water solution over a 24-hour period. Unlike opiates, alcohol does not lower respiratory activity. Also, again as distinct from opiates, it tends to dilate blood vessels rather than constrict them, so that injecting patients with heart trouble is recommended by the doctors as an aid in the use of anesthetics.

An added advantage of the alcohol therapy, especially in cases where patients have been weakened by their illness, is that alcohol has a nutritional value because it is quickly converted into energy by the body.

New Theory: Reduction, Not Oxidation, Causes Paint Deterioration

A reducing action, rather than oxidation, may be the cause of paint deterioration, according to a new chemical theory. Evolved in work on auto finishes, the new theory may also apply to house paints and other protective coatings.

It was thought in the past that the dull film or "chalk" that sometimes develops on auto finishes was caused by combination of the lacquer or enamel materials with oxygen of the air. In tests, lacquer and enamel films were subjected to hydrogen peroxide to see if it would hasten the process, but the attempts failed. Realizing that under certain conditions hydrogen peroxide may act as a reducing agent, the researchers set up these conditions by smearing water or a wetting agent on the test panels, whereupon "chalk" formed in a matter of minutes.

Develop More New Uses For Polyvinyl Pyrrolidine

A new polyvinyl pyrrolidine product, to be used by dyers for removing color from textiles and said to have no harmful effects, has been placed on the market, a German company reveals. Another new polyvinyl pyrrolidine product for use as a laundry cleaning agent is reported in the experimental stage. Other experiments are in progress for improving medicinal and other products made with polyvinyl pyrrolidine.

New Booklet Reviews Fertilizer Technology

Special articles reviewing the activities of the Tennessee Valley Authority in fertilizer technology are featured in a recent issue of a government bibliography of technical reports. Chemical plant facilities are described and research work with phosphates, nitrates, and potash is covered. Also listed are currently available chemical engineering reports on the subject.

Southern Dealers to Show New U.S.I. Sound Movie On Pyrenone Grain Protectant

Insect Infestation Problem in Stored Grain Is Dramatized To Farmers by Cartoon Character 'Wicked Willie Weevil'

A 16 mm sound movie film that will run about 15 minutes is being readied for showing by Pyrenone Grain Protectant dealers throughout the South. The film features a cartoon character called "Wicked Willie Weevil."

Wicked Willie Weevil tells the story of insect damage to stored grain and how Pyrenone Grain Protectant stops it. The film uses this cartoon character to dramatize to farmers

Most southern corn cribs are of open construction. Insects have little difficulty stealing corn from farmers when it's so easy to enter the crib.

the seriousness of the insect problem to stored grain in the South. The film will be shown

MORE

Bond Silicone Rubber To Steel, Other Surfaces

A method of joining silicone rubber to steel and other surfaces in a permanent bond stronger than rubber itself, has reportedly been discovered. Key to the process is said to be a thin, glue-like "primer," which forms a strong bond between silicone rubber and many surfaces besides steel, including glass, ceramics, aluminum, tin, and copper. Development of the primer is expected to increase the usefulness of silicone rubber in structural combination with metals.

To produce the bond, the liquid primer is brushed or sprayed on the metal or glass surface to be joined to silicone rubber. After drying, the surfaces are placed together and light pressure is applied at about 250°F. The resulting bond is claimed to withstand temperatures from −85°F. to 500°F. In laboratory experiments, the bond has shown a strength of about 700 pounds per square inch of holding area.

Possible applications include engine and shock mounts and heavy-duty washers or gaskets, for industrial applications, made of glass fibre bonded between layers of silicone rubber.

New Chemical Skin For Wrapping Foods Is Edible

A new edible skin for wrapping food products, said to seal in odor and flavor, to keep out moisture, and to be comparatively resistant to bacteria and mold, has been developed. Chemically the new skins are known as acetostearins and are prepared by direct acetylation of monostearin with acetic anhydride. These acetostearins, claimed to be relatively stable, solidify to a flexible but non-greasy solid. Over half of the acetostearins prepared by the chemist responsible for the development stretched over 800% at 22°C., and no cracking was observed at temperatures as low as 4°C., according to his report. The acetostearins are said to be as easy to apply as paraffin.

Germans Synthesize Carotin

A process for making synthetic carotin for use in vitaminizing and coloring margarine has been developed by a German scientist. Work is now underway to adapt the laboratory synthesis to commercial production.

Colloid Chemicals Prevent Kidney Stone Formation

A new method of preventing formation of kidney stones is being based on the theory that growth of these crystal deposits in the kidneys is prevented in normal persons by the presence in the urine of certain types of colloid. Research indicates that the stones are most prevalent in people lacking these colloids. Various types of colloid will gel at certain concentrations and prevent mineral matter in the urine from crystallizing. Results obtained thus far from injecting colloidal agents into the body are described as very encouraging.

Synthesize Plant Sugar Outside of Plant Cell

For the first time plant sugar has been produced outside of a plant cell according to a recent report by a university scientist. When a test tube containing a mixture of water, carbon dioxide, and various substances taken from hog and pigeon livers and from plant leaves, was exposed to light, the mixture was transformed into plant sugar, it is claimed.

CONTINUED

New U.S.I. Sound Movie

at a series of dealer-farmer meetings to be held in southern towns before harvest season. While the film will be the main feature of the meeting, it is anticipated that individual dealers will arrange for local entertainment and serve refreshments to insure good attendance.

The new movie tells the story of Pyrenone Grain Protectant quickly and effectively. The

Insect infested corn has lost so much of its food value that it is practically worthless for livestock feeding.

mass showings that the film makes possible will enable U.S.I. to introduce its new Pyrenone Grain Protectant to a large number of people in a short time.

Requests Pour in for 'Quart Jar Test' Kits

Another item that has been creating a tremendous amount of interest among southern farmers and dealers is the "Quart Jar Test" kit. This kit contains a sample of Pyrenone Grain Protectant and other necessary pieces to set up a small-scale test. To make the test, the farmer shells corn from his crib into two one-quart mason jars. He treats the corn in one of the jars with Pyrenone Grain Protectant and leaves the other untreated. Within 30 to 60 days the farmer can see clean corn, with a few dead insects visible, in the treated jar, while the untreated one swarms with live weevils.

Requests for the Quart Jar Test kits have been pouring in to U.S.I. and are positive evidence of the urgent need for a product that will control stored grain pests.

New Condensation Method Produces Vinyl Polymers

A new condensation procedure, now in the laboratory stage, reportedly has possibilities for use in producing vinyl polymers. In the laboratory, condensation of formaldehyde with the following compounds is said to have given these high yields of monomethylol derivatives: with acetone, 84%; with methyl ethyl ketone, 91%; with diethyl ketone, 75%, and with nitromethane, 64%. Reactions were carried out, it is claimed, by refluxing an activated compound like methyl ethyl ketone from a heated flask into a fractionating column packed with glass helices. Formaldehyde and sodium hydroxide catalyst were added slowly at the top of the column, and a large excess of ketone over formaldehyde was maintained in the reaction zone, according to the report. The monomethylol derivative is said to have been removed from the reaction zone by continuous rectification before self-condensation or secondary actions could take place. The sodium hydroxide is reportedly neutralized in the boiling flask to prevent further aldol condensations.

Use Electron Bombardment To Cause Polymerization

The possibility of making solid plastics from liquid raw materials by bombarding them with high-voltage electron beams is foreseen as a result of recent experiments reported by two scientists. Chemical means are usually used to initiate polymerization, but the scientists have found that a beam of electrons with energies of 800,000 volts, brought into the open air, is also able to cause such polymerization.

Most of their experiments were performed with tetraethyleneglycol dimethacrylate but they stated that various other compounds could similarly be polymerized with cathode rays. Among these, it is claimed, are styrene, acrylonitrile, and methacrylates. The recent experiments were performed with a modified million-volt X-ray machine.

TECHNICAL DEVELOPMENTS

Information about manufacturers of these items may be obtained by writing U.S.I.

A new type adhesive to meet storing and shipping needs reportedly will seal tight and open easily. Used now in palletizing, it is described as strong enough to hold stacked merchandise and as breaking clean and fast in unstacking. **(No. 719)**

A new refractory coating, said to give a smooth, hard surface for greater reflection of heat and to lengthen life of firebricks, is easy to apply by brush or spray, and will not crack off or flake, the makers state. **(No. 720)**

A new joint sealing compound is claimed to hold carbon tetrachloride, ethylene dichloride, benzene, toluene, xylene, propane, chloroform, methyl chloride, and many other difficult-to-hold compounds. **(No. 721)**

A new coating for polystyrene plastics, designed for use on the reverse side of clear plastics, gives a finish almost as brilliant as plating or metallizing, according to the manufacturers. **(No. 723)**

A new primer that weds rust is reported capable of locking paint film — particularly vinyls — to surfaces having adherent rust. Compatible with all finishes tried on it thus far, it reduces splitting of top vinyl finished to nearly zero, the makers claim. **(No. 723)**

"Electric sheets" of white, maize, blue, or pink mercerized broadcloth are on the market. Made with either single or dual controls, the sheets will operate from any 115-volt AC outlet. **(No. 724)**

For measurement of dry film coatings, a new easy-to-use, fast reading, self-contained gage requiring no outside source of power is reported available. Results are said to be independent of composition or thickness of base on which the coating is being measured. Base need only be electrically conductive. **(No. 725)**

A new vinyl plasticizer for use in sheeting, wire covering, shoe soles, and other compositions that must withstand severe flexing and stretching, is claimed to impart flame retardance and to have high permanence on heat aging and aging in water, gasoline and oil. **(No. 726)**

New chemical resistant bags for shipping and storing organic substances like foods and fertilizers and many other chemicals are described as economical, easy to print, and highly resistant to water vapor. Made of paper coated with odorless and tasteless polyethylene resins, the bags are said to be strong and durable and to keep packaged foods fresh. **(No. 727)**

Crystal-clear bonding of white styrofoam is reported possible using a vinyl-based cement now in use for cementing other plastics. This cement answers the need for an efficient, water-white, non-staining adhesive, it is claimed. **(No. 728)**

PRODUCTS OF U.S.I.

ALCOHOLS
Amyl Alcohol (Isoamyl Alcohol)
Butanol (Normal-Butyl Alcohol)
Fusel Oil—Refined
Propanol (Normal-Propyl Alcohol)
Ethanol (Ethyl Alcohol)
Specially Denatured—all regular and anhydrous formulas
Completely Denatured—all regular and anhydrous formulas
Pure—190 proof U.S.P., Absolute—200 Proof
Solox*—proprietary solvent—regular and anhydrous
ANTI-FREEZE
Super Pyro* Anti-Freeze
U.S.I. Permanent Anti-Freeze
ANSOLS
Ansol* M
Ansol* PR
ACETIC ESTERS
Amyl Acetate—Commercial and High Test
Butyl Acetate
Ethyl Acetate—all grades
Normal-Propyl Acetate
OXALIC ESTERS
Dibutyl Oxalate
Diethyl Oxalate
PHTHALIC ESTERS
Dibutyl Phthalate
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OTHER ESTERS
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Ethyl Chloroformate
INTERMEDIATES
Acetoacetanilide
Acetoacet-ortho-chloroanilide
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Ethyl Benzoylacetate
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DL-Methionine
Riboflavin Concentrates
Special Liquid Curbay*
U.S.I. Vitamin B_{12} and Antibiotic Feed Supplements
Vacotone* 40
RESINS (Synthetic and Natural)
Arochem*—modified types
Arofene*—pure phenolics
Aroflat—for special flat finishes
Aroplas*—alkyds and allied materials
Congo Gums—raw, fused and esterified
Ester Gums—all types
Natural Resins—all standard grades
INSECTICIDE MATERIALS
CPR Concentrates: Liquid & Dust
Piperonyl Butoxide
Piperonyl Cyclonene
Pyrenone* Concentrates: Liquid & Dust
Pyrethrum Products: Liquid & Dust
Rotenone Products: Liquid & Dust
INSECTIFUGE MATERIALS
Indalone*
Triple-Mix Repellents
OTHER PRODUCTS
Colladions
Ethylene
Nitrocellulose Solutions
PiB*—Liquid Insulation
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Thousands of man-hours and dollars are devoted each year to fundamental color technology. The results of this unusual storehouse of color "know-how" are here for application to your problems.

Hundreds of charts record the effect of stabilizers and lubricants on the heat and light stability of the important colorants in vinyl compounds. Competent color technologists are ready to advise and help you.

Our Naugatuck laboratory is *your* laboratory with vast amounts of data on colorants, stabilizers, plasticizers, and plastic processing techniques. And our Naugatuck Marvinol resins have the *stability* your products need.

Yes, Naugatuck is a sound base for your plastics future—with the right combination of laboratory "know-how" plus the best resins or resin combinations for your future. Why not see how much our scientific service and our Marvinol resins can do for your products? Write us today on your company letterhead. Send inquiry to the address below.

Naugatuck Chemical Division of UNITED STATES RUBBER COMPANY

209 ELM ST., NAUGATUCK, CONNECTICUT

BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • New York • Philadelphia • IN CANADA: Naugatuck Chemicals, Elmira, Ontario

MARVINOL® vinyl resins • KRALASTIC® styrene copolymers • VIBRIN® polyester resins

Rubber Chemicals
Aromatics
Synthetic Rubber
Agricultural Chemicals
Reclaimed Rubber
Latices

Baker Platinum Laboratory Ware

Production of platinum laboratory ware has been a specialty of ours for almost three-quarters of a century, and we have devoted a great deal of research and experiment to improving it.

This work has been aided greatly by the fact that we maintain and operate large scientific laboratories and use our own platinum ware in them.

Thus, the ware is subjected to day in, day out tests through use, and practical experience has brought about a number of improvements, among which are:

Improvements in metallurgical processes which have increased its useful life — development of the platinum-rhodium alloy which is now so widely used — design changes like the reinforced rim on crucibles and dishes — development of the low form crucible — improvements in the design of platinum electrodes.

You run no risk in making Baker Platinum Laboratory Ware standard equipment.

BAKER & CO., INC.

113 Astor St., Newark 5, N. J.

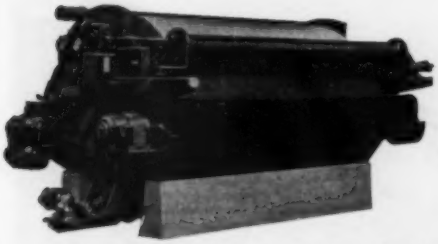
NEW YORK **SAN FRANCISCO** **CHICAGO**

OLIVER

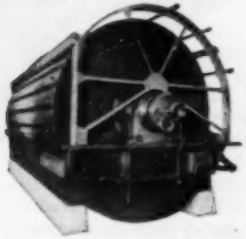
Each the Nemesis of Pulps Forming Thin, Sticky, Flow-Retarding Cakes

Precoat FILTER

Panel FILTER



• The Oliver Precoat Filter operates in continuous cycles with a pre-formed 'precoat' of suitable porous material such as diatomaceous earth. Solids form a thin film on the surface of this precoat which is shaved off by a traveling knife edge as the drum rotates, leaving continually a fresh surface of precoat for cake deposition. Actual filtration continuous for periods ranging from 8 hours to several weeks before the precoat is used up and a new one has to be formed. Precoating takes an hour or two.



• The Oliver Panel Filter in contrast to the Precoat Filter doesn't use a precoat. Nor is there any wire winding to hold the cloth on the drum. An ingenious discharge mechanism picks the thin cake off the cloth leaving it clean and ready for further cake deposition. The cloth is in a relatively small piece and is held in place by caulking into recesses between sections.

WHY two distinctly different filters for handling pulp forming one class of filter cake? Another question answers that one: "What do you want to do with the cake? Keep it or throw it away?"

The Precoat Filter makes use of a pre-formed layer or 'precoat' of filter aid which, as it is removed with the cake, mixes with it. Usually such cakes are discarded, although it is often possible to separate the solids from the precoat by a suitable solvent.

The Panel Filter does not use a precoat or pre-formed layer of filter aids. Thus it discharges the solids uncontaminated in any way. It, too, handles easily those thin, sticky, flow-retarding cakes. It is usually recommended when the cake is valuable or is to be processed further. We call these two filters to your attention in case you wish to obtain the advantages of continuous and automatic filtration of a pulp that for one reason or another produces an extremely thin cake.

New York 18 — 33 W. 42nd St. Chicago 1 — 221 N. LaSalle St.
Oakland 1 — 2900 Glascock St. San Francisco 11 — 260 Calif. St.
Export Sales Office — New York • Cable — OLIUNIFILT

FACTORIES: Hazleton, Pa. Oakland, Calif.

OLIVER UNITED FILTERS DUF INC.

WORLD WIDE SALES, SERVICE AND MANUFACTURING FACILITIES

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Dorr-Oliver S.a.R.L. Milano
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HAWAIIAN ISLANDS
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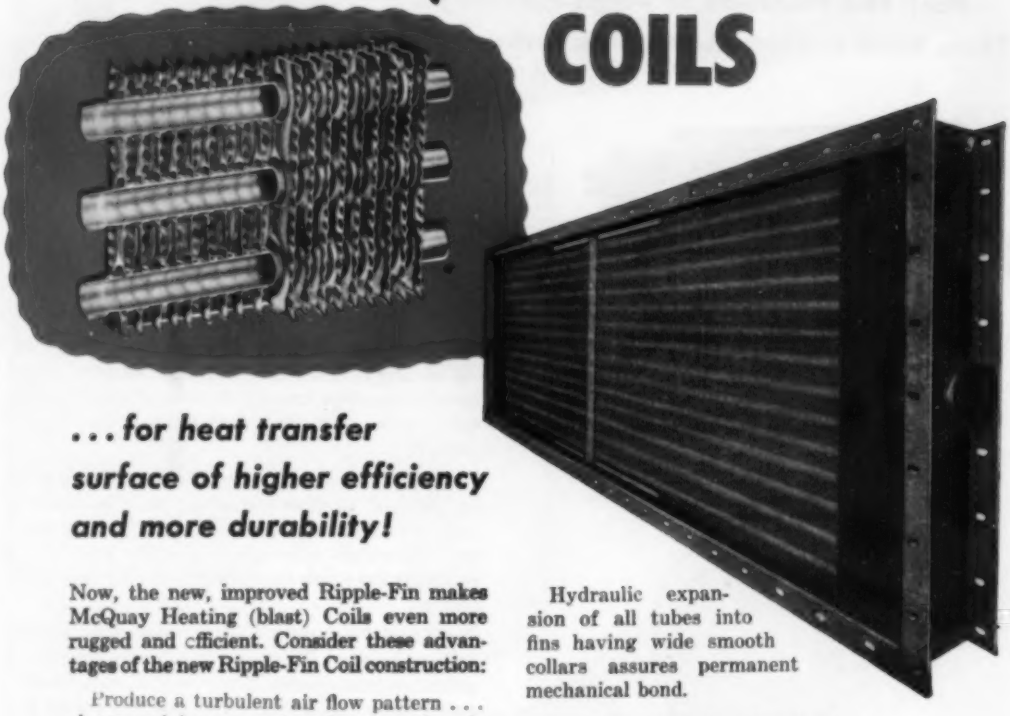
McQuay's NEW RIPPLE FIN COILS



. . . for heat transfer surface of higher efficiency and more durability!

Now, the new, improved Ripple-Fin makes McQuay Heating (blast) Coils even more rugged and efficient. Consider these advantages of the new Ripple-Fin Coil construction:

Produce a turbulent air flow pattern . . . closer and longer contact between the air stream and the coil surface, preventing air by-pass and producing faster heat transfer.

Offer greater heat transfer surface.

Give higher flexible strength with minimum air friction and cleaner operation.

Copper tube headers provide inherent flexibility to accommodate unequal contraction and expansion.

Hydraulic expansion of all tubes into fins having wide smooth collars assures permanent mechanical bond.

Intruded tube holes allow headers to flex and absorb uneven stresses.

Available in a wide variety of styles and sizes. Both standard and special coils for steam, hot water, cold water, brine, direct expansion, refrigerant condensing, and other applications. Write, McQuay, Inc., 1622 Broadway St. N.E., Minneapolis 13, Minn. Representatives in all principal cities.

McQuay INC.

HEATING • AIR CONDITIONING • REFRIGERATION

SLEEVOIL

—the super-quality fan bearing for mechanized draft installations!

● Hundreds of generating plants in America run on Dodge Sleevoil Bearings. These famous bearings combine quietness, long life and dependability to a degree unique in the bearing field. They offer engineers of costly power plants a priceless safeguard for their equipment.

Sleevoil Bearings are a Dodge development—created especially to meet the exacting requirements of fan and blower service. They are ideal bearings for important installations calling for induced or forced draft. Designed in cooperation with engineers of leading fan and blower manufacturers, they have a long record of dependable performance in critical service.

Dodge Sleevoil Pillow Blocks are normally available from stock—in both plain and water-cooled types, in shaft sizes from 1-7/16" to 8". Write us for information.

DODGE MANUFACTURING CORPORATION
200 Union Street, Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on *modern* power transmission machinery for *modern* installations. Look for his name under "Power Transmission Equipment" in your local classified phone book.

FIRST IN POWER TRANSMISSION MACHINERY!

SEALED-LIFE V-BELTS; TAPER-LOCK SHEAVES

TORQUE-ARM SPEED REDUCERS

DODGE-TIMKEN PILLOW BLOCKS

ROLLING MILL AND ROUGHING E CLUTCHES

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FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO 22, ILLINOIS

● Corrugated Transite plays a major role in the construction of a large aviation plant. The inset photograph shows the same building under construction.

CORRUGATED TRANSITE* *For expansion in essential industries*

*Transite is a registered Johns-Manville trade mark

Because it goes up fast . . . requires a minimum of framing . . . Johns-Manville Corrugated Transite, the large asbestos building sheet, is ideal for defense construction.

Made of two practically indestructible materials, asbestos and cement, Corrugated Transite is fireproof, rotproof, and rustproof. The large, easy-to-handle sheets with their unusual strength provide durable, weatherproof walls and roofs.

With a minimum of framing required, sheets of Corrugated Transite are quickly and easily applied . . . construction costs are greatly reduced. When conversion or expansion is necessary, these sheets can be salvaged and re-used.

The natural stone-gray color of Transite is attractive without further decoration—it never needs preservative treatment. This modern building sheet with its streamlined corrugations and attractive shadow lines has great architectural appeal and is being increasingly used—inside as well as out.

If you're planning construction that you want to build fast, look well, last long—investigate Johns-Manville Corrugated Transite! For full details write Johns-Manville, Box 158, Dept. CE-9, New York 16, N. Y. In Canada, write 199 Bay Street, Toronto 1, Ontario.

EASY TO FASTEN TO STEEL

EASY TO SAW

EASY TO DRILL

EASY TO NAIL TO WOOD

Johns-Manville *Asbestos* **CORRUGATED TRANSITE**

ALUMINUM

FABRICATION BY GRAVER

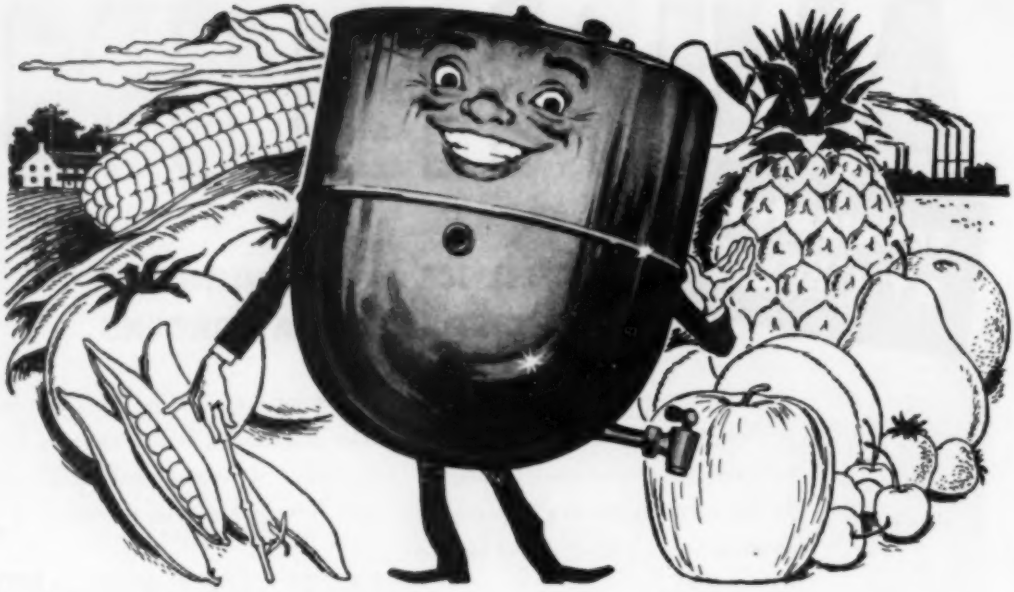
EXCELLENCE OF TECHNIQUE REFLECTED IN REPEAT ORDERS

The skillful workmanship and rigid quality controls which produced three Graver-built aluminum bins — specially designed for the process system of a large organic chemical plant — are evidenced by a recent re-order.

This is another example to verify the fact that industries of many types rely on Graver for precision and precaution in alloy fabrications. It also indicates the excellence of Graver workmanship — both in the shop and in the field.

GRAVER TANK & MFG. CO., INC.
EAST CHICAGO, INDIANA
NEW YORK • CHICAGO • PHILADELPHIA • WASHINGTON
DETROIT • CINCINNATI • CATASAUQUA, PA.
HOUSTON • SAND SPRINGS, OKLA.

Aluminum Bin — 12' dia. x 31'3" long fabricated by Graver for Gulf Coast chemical plant.



You'll agree with the Food Business that Stainless Steel is good Business

FOOD processing and packing is an art and science in which the United States leads the rest of the world by the proverbial country mile. It means something, therefore, that U. S. canners, packers and bottlers predominantly use equipment made of stainless steel.

It means that, as good businessmen, they've found that stainless steel best protects flavor and purity, makes cleaning easier and less costly, and gives longer service life with less maintenance. Stainless *does* these things best because no other commercially available metal is as strong and as resistant to corrosion, heat and wear, taking all these virtues together.

Consequently, in a national emergency, the time-tested stainless steel—Allegheny Metal—is more than ever "good business" for many highly essential applications. Less essential uses have to give way to jet engines, aircraft and marine equipment, transportation, food, dairy, chemical plant and refinery uses, etc. But we're continuing to spend many millions of dollars to expand our already multiplied production, and we offer every assistance to fabricators to make the supply of stainless steel go as far as possible.

* * * * *

Complete technical and fabricating data—engineering help, too—are yours for the asking from Allegheny Ludlum, the nation's leading producer of stainless steel in all forms. Branch Offices are located in principal cities, coast to coast, and Warehouse Stocks of Allegheny Stainless Steel are carried by all Joseph T. Ryerson & Son, Inc. plants. ● *For any assistance,* write or call Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa.

You can make it **BETTER** with

Allegheny Metal

TIME-TESTED STAINLESS STEEL

BECKMAN—*the leading name in pH—presents another important advancement in instrumentation*

Announcing The BECKMAN MODEL N pH METER

Completely Portable!

Extremely Compact!

. . . and Really Rugged!

In the constantly expanding field of pH, there is wide demand for a *completely portable* battery-operated pH instrument that is low in price, light in weight, compact in size, and amply rugged to be used anywhere—in the orchard, in the oilfields, in textile mills, plating shops, mining and mill operations, food processing plants, laboratories . . . *anywhere*, without dependence upon outside power circuits.

The newly developed Beckman Model N pH Meter not only meets all these requirements, but also many more. Here are the highlights. Check them over. *Never before have unique advantages like these been combined into a single pH instrument!*

OPERATING SIMPLICITY AND ACCURACY . . .

- Accuracy to better than 0.05 pH.
- Low operating cost—less than 2c per hour.
- Built-in temperature compensation—0° to 100° C.
- Fast warm-up—less than 10 seconds.
- "Check Pointer" eliminates need for frequent buffer standardization.
- Batteries are easily checked with the regular panel controls—no need to disassemble the instrument. Clip-mounting of batteries eliminates need for soldering or wiring.

NEW COMPACTNESS AND RUGGEDNESS . . .

- All-metal case—cast aluminum with baked enamel finish to resist wear and corrosion.
- Splash-proof design—fully desiccated internally.
- Shock-proof—each tube is individually shock-mounted.
- Light weight—less than 8 lbs., complete.
- Small, compact—only 4" x 6" x 9½" overall.
- Equipped with the new Beckman Red Label Glass Electrode—virtually unbreakable, covers almost the entire pH range, usable from freezing to boiling.
- By far the most rugged overall construction of any pH meter.

GET ALL THE FACTS on this newest Beckman advancement in pH by contacting your nearest authorized Beckman instrument dealer. Or write direct!

BECKMAN INSTRUMENTS

SOUTH PASADENA 14, CALIFORNIA

Factory Service Branches: Chicago — New York — Los Angeles

Beckman Instruments include: pH Meters and Electrodes — Spectrophotometers — Automatic Titrators — Radioactivity Meters — and Special Instruments

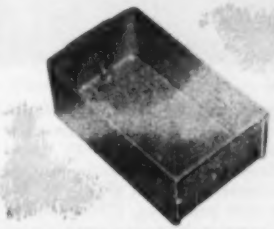
---

NEW **CONVENIENCE SIMPLICITY RUGGEDNESS**

make the Beckman Model N a noteworthy advancement. The following features are typical . . .

ELECTRODE SUPPORT ROTATES alongside case for maximum convenience in carrying. Instrument can be used in either horizontal position (shown at left) or vertical position (above)—whichever is handier.

CONVENIENT CONTROLS not only centralize all operating functions, but also permit checking amplifier circuits and battery condition without opening case or disturbing battery connections.



RUGGED, COMPACT DESIGN withstands rough field and plant service with negligible maintenance. Solid cast-aluminum case is strong, yet light in weight. Beckman Glass Electrode is virtually unbreakable!

There are many other important features designed into the Model N. Be sure to get the *complete* story on this new Beckman development!

Your CHEMICO PLANT starts here

FROM original idea to performance-guaranteed installation, each Chemico process is carefully tested and developed in these well-equipped laboratories and pilot plant.

On new processes, pilot plant or semi-commercial scale operations are conducted until they are fully proven. As a result, "growing pains" are radically reduced, proper construction materials can be selected and equipment sizes calculated for large scale commercial operation.

By means of these step-by-step, developmental methods, Chemico has given industry the drum-type, flash film and high temperature acid concentrators, the hot coke sludge conversion process, a new sulfur recovery process, economical plants for recovering alkylation spent acid and pickle liquor, and many other well-known and widely accepted processes.

Today, Chemico laboratory technicians and pilot plant operators in Linden, N. J. are busy proving out ideas that promise much for the future.

Extensive use of laboratory and pilot plant research is another important reason why Chemico plants are profitable investments.

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

488 MADISON AVENUE, NEW YORK 22, N. Y.

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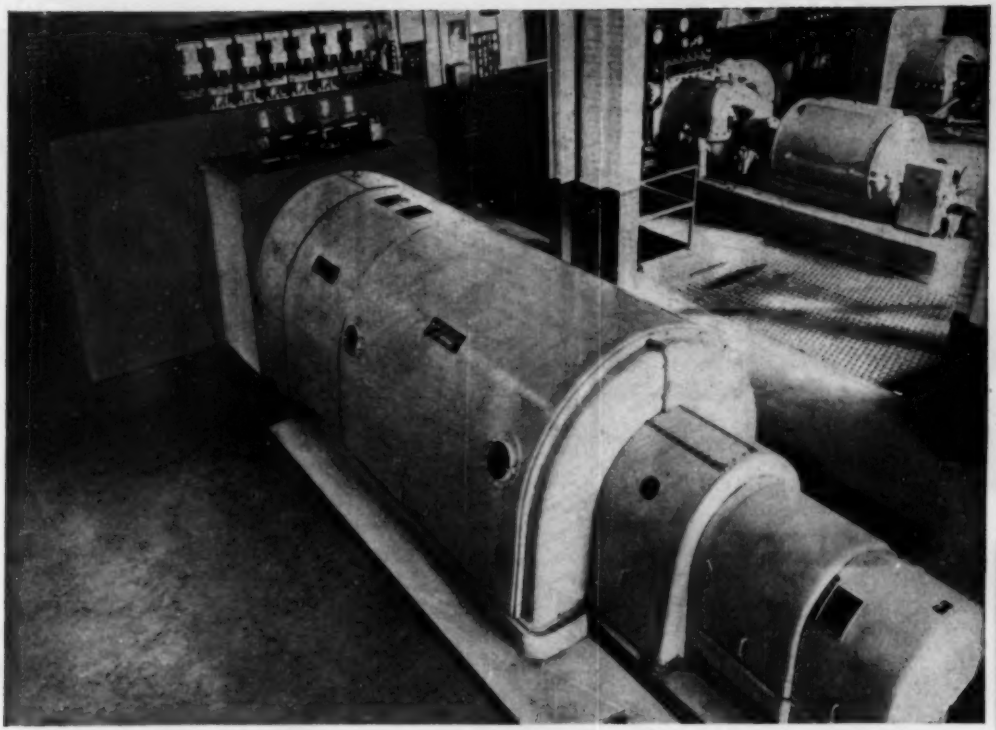
Chemico Plants are Profitable Investments

CC 224



How Rock Hill and Worthington Balanced Steam and Power

During its fast growth, Rock Hill Printing and Finishing Company, Rock Hill, South Carolina, has made extensive changes in the power plant.

Since 1929 electrical demand has greatly increased. Also, plant process has called for large quantities of steam at 90-100 psi and at 15 psi pressure.

When a new 150,000 lb-hr boiler was installed, another Worthington 5000-kw non-condensing extraction-type turbine generator was also installed. This latest Worthington unit operates on steam at 230 psi, 575 FTT, and automatically extracts steam at 100 psi, exhausting at 15 psi back pressure.

The unit has sufficient flexibility between extraction and back pressure to handle variations in flow requirements and to carry an electrical load varying from 3000 up to an anticipated 5000 kw.

By purchasing a *Worthington* unit, Rock Hill also benefits from unit responsibility for design, assembly and performance.

Worthington builds turbine-generator sets in sizes up to 10,000 kw and in all types. For detailed proof that *there's more worth in Worthington*, call our nearest office or write to Worthington Pump and Machinery Corporation, Steam Turbine Division, Wellsville, New York.

WORTHINGTON

STEAM TURBINE GENERATORS

U-17

FOR THE PLANT YOU ARE PLANNING FOR TOMORROW

The **Cameron**

NON-LUBRICATED

LIFT-PLUG VALVE

-give it the "acid test" in your plant for first hand performance data!

After six years of testing and service in the most difficult chemical services, and under elevated temperatures, high pressures and vacuum, the Cameron Non-Lubricated Lift-Plug Valve has proved superior to conventional designs.

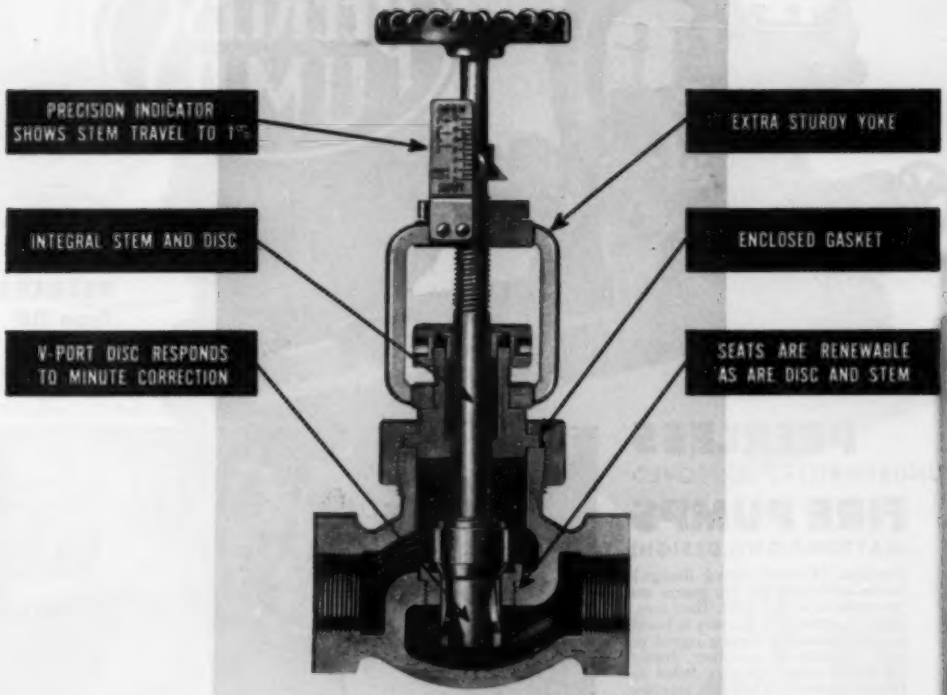
Featuring a renewable seat, which is separate from and not attached to the valve body, the Cameron Lift-Plug Valve offers a new approach to basic valve design, providing a tight seal and easy operation without the use of lubricants. The separate and renewable seat also makes for low maintenance and easy trimming for corrosive services.

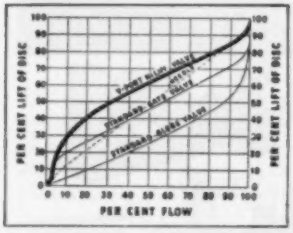
Cameron IRON WORKS, INC.

P. O. BOX 1212, HOUSTON, TEXAS

Export: 74 Trinity Place, New York, N. Y. Represented in the sterling area by: British Oilfield Equipment Co., Ltd., Duke's Court, St. James's, London S.W.1, Eng.

Assures greater precision in manual control of flow . . . the Honeywell HI-LIFT valve


PRECISION INDICATOR SHOWS STEM TRAVEL TO 1%
INTEGRAL STEM AND DISC
V-PORT DISC RESPONDS TO MINUTE CORRECTION
EXTRA STURDY YOKE
ENCLOSED GASKET
SEATS ARE RENEWABLE AS ARE DISC AND STEM
Write for Bulletin 242-2



Flow characteristics of the Honeywell Hi-Lift Hand Control Valve far surpass those of conventional designs . . . offer favorable comparison to the precision of such diaphragm operated control valves as the Honeywell Series 700.

THE superior flow characteristics of the Honeywell Hi-Lift Hand Control Valve become immediately apparent when compared with conventional globe or gate valves.

In addition to the illustrated features, your comparison will show how the positive-seated, V-ported (or contoured) disc assures proportional flow throughout the entire lift of the stem . . . how the micrometer indicator is set to control flow *within one-hundredth of a turn of the stem* . . . how the unique construction prevents spinning of valve disc during operation, permits repacking with valve open and under pressure.

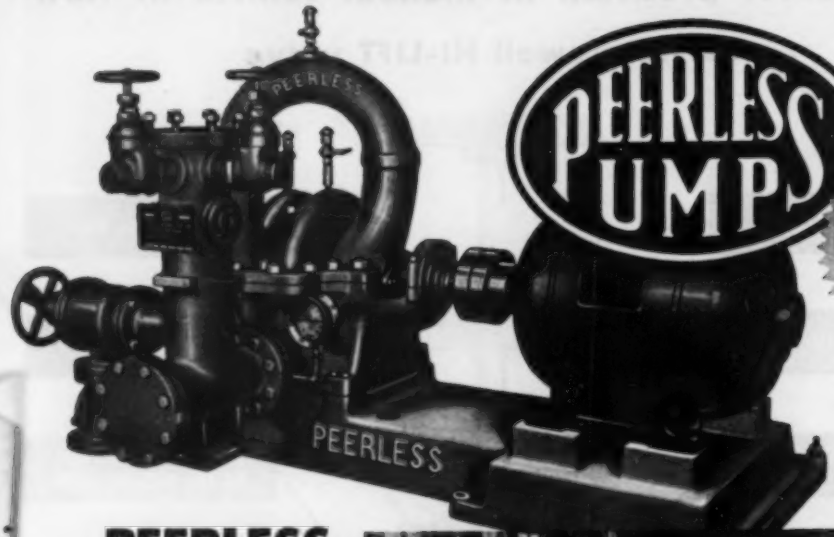
Write for Bulletin 242-2.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 1904 Windrim Ave., Philadelphia 44, Pa.

MINNEAPOLIS **Honeywell**

Valve Products

FOR UNSURPASSED FIRE PROTECTION PUMPS *LOOK TO THE LEADER—LOOK TO PEERLESS*



PEERLESS PUMPS

FULLY APPROVED UL FM

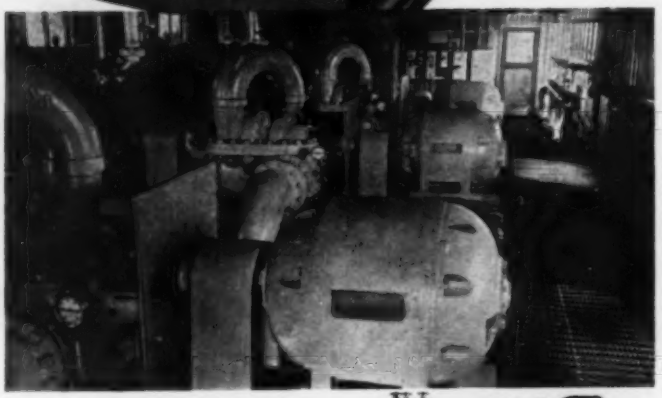
PEERLESS
Type TUF
Two Stage
Horizontal Centrifugal
Fire Pump

PEERLESS
UNDERWRITERS' APPROVED
FIRE PUMPS
(DAYTON-DOWD DESIGN)

Peerless (Dayton-Dowd design) horizontal centrifugal fire pumps are pre-eminent in their field. Their complete acceptance by industry is based on an outstanding service record of over a quarter of a century, during which no pump has ever failed to receive approval or failed to function in an emergency.

The unsurpassed operative dependability of the Peerless horizontal fire pump results in measurable savings to plant owners and operators. A first class fire protection plan built around Peerless horizontal fire pumps assures positive protection, peak quality performance and unquestioned reliability.

Peerless Underwriters' approved horizontal fire pumps are available in two types. The Type TUF (illustrated above) is a two stage pump, available in 4", 5", 6" and 8" discharge sizes, with a capacity range of from 500 to 1500 gpm and with pressure range, at rated capacities of from 100 to 200 pounds. Approved types of drive include electric motor, gasoline or diesel engine. An excellent application of Peerless Type TUF fire pumps is shown in the installation view where three pumps



are a part of a water-foam protection system delivering 130,000 gallons of foam in 3 minutes for protection against the hazards of solvent spills. Peerless also manufacture single stage horizontal approved fire pumps, designated as the Type AF, available in the same discharge sizes but furnishing capacities up to 2500 gpm with pressure range from 40 to 150 lbs.

WRITE FOR BULLETIN A 24-page, fully illustrated, engineering bulletin describes both Type TUF and Type AF approved Peerless fire pumps and auxiliary equipment. Request Bulletin No. B-1500.

PEERLESS ALSO MANUFACTURES APPROVED SINGLE-STAGE HORIZONTAL FIRE PUMPS AND APPROVED VERTICAL TURBINE TYPE FIRE PUMPS

Come to Peerless for complete information on approved fire protection pumping systems. Our engineering department is available for consultation without obligation.

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Address inquiries to Factories at:
Los Angeles 31, California and Indianapolis 8, Indiana
Offices: New York, Chicago, St. Louis, Atlanta, Dallas, Plainview and Lubbock, Texas; Fresno; Los Angeles; Phoenix; Albuquerque, New Mexico.

PEERLESS PUMPS fmc

If you have a Boiler Water Problem investigate....

GRAVER ZEOLITE WATER SOFTENERS

Is your water supply unsatisfactory for boiler feed because of hardness... alkalinity... silica... or any other impurity?

No matter what may be your problem, you'll find the correct solution in exactly suitable Graver processes and equipment. For example:

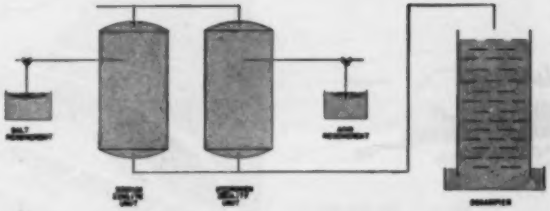
SODIUM ZEOLITE for elimination of hardness

HYDROGEN ZEOLITE for elimination of both hardness and alkalinity

DEMINERALIZING for elimination of ALL electrolytes, with silica removal, too, if necessary, producing the equivalent of distilled water at a fraction of the cost.

And if any other water treatment is required for your particular plant conditions, equally effective Graver processes and equipment are available... *Hot Process*... *Cold Process*... *Deaeration*... *Filtration*... *Removal of Special Impurities.*

Write for information on processes and equipment in which you are interested... there's no obligation.



GRAVER HYDROGEN-SODIUM ZEOLITE BLEND SYSTEM

The completeness of the Graver line of water conditioning processes and equipment makes Graver recommendations impartial ... just as the 40-year experience of the Graver engineers and chemists makes their recommendations authoritative.

These are some of the reasons why critical engineers of leading plants in every industry have selected Graver equipment for their water conditioning requirements.

●

Send for Technical Articles on "Operating Experiences with Resin Zeolites on the Hydrogen Cycle", "High-Pressure Boiler Feedwater Treatment", and "Boiler Feedwater Treatment for a High-Pressure, High-Make-Up Power and Steam Producing Plant".

GRAVER

GRAVER WATER CONDITIONING CO.

Division of Graver Tank & Mfg. Co., Inc.

216 WEST 14th STREET, NEW YORK 11, N. Y.

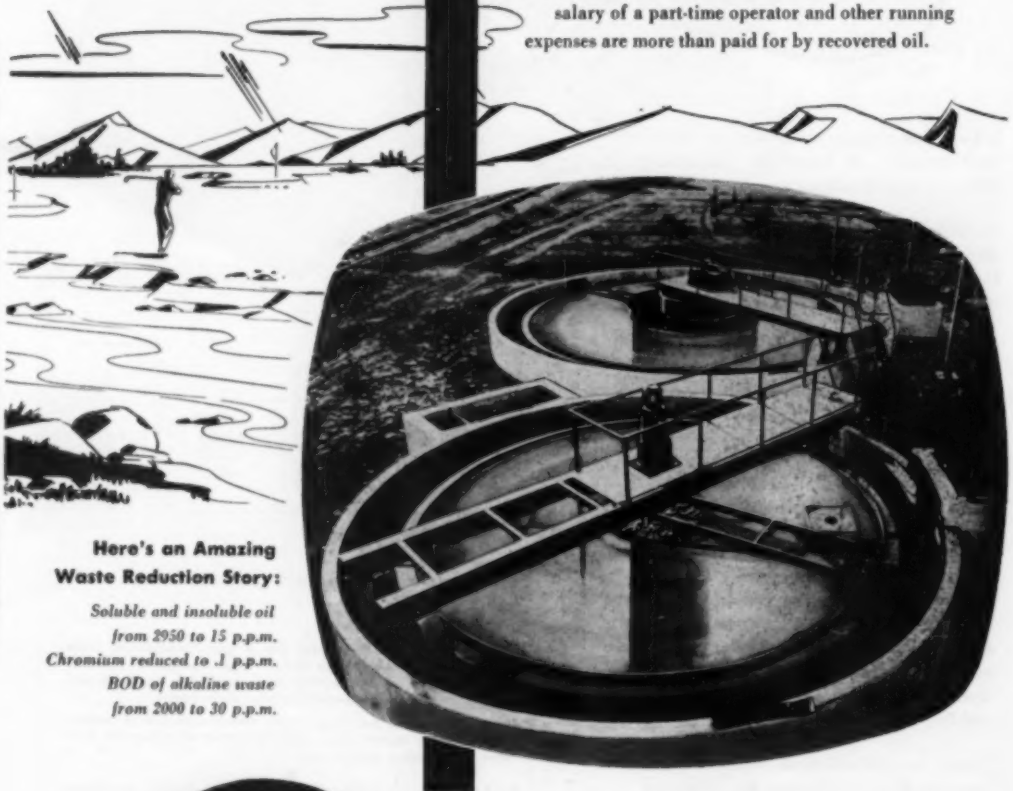
GW 446

recovered oil pays for Cyclator® Operation

AT THIS OHIO MANUFACTURING PLANT

Effluent Sparkles in Golf Course Stream

THIS large Ohio manufacturing plant had over 100,000 g.p.d. of waste liquids, including pickling acids, chrome plating residues, cutting oils and alkaline cleaner solutions. With the Cyclator and a primary clarifier the effluent is so clean it furnishes the main flow for a nearby golf course stream! Chemical cost of $12.00 per day, the salary of a part-time operator and other running expenses are more than paid for by recovered oil.



Here's an Amazing Waste Reduction Story:

Soluble and insoluble oil from 2950 to 15 p.p.m.
Chromium reduced to .1 p.p.m.
BOD of alkaline waste from 2000 to 30 p.p.m.

INFILCO

* BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1934 *

INFILCO INCORPORATED | *Tucson, Arizona*

FIELD ENGINEERING OFFICES IN 26 PRINCIPAL CITIES

World's Leading Manufacturers of Water Conditioning and Waste-Treating Equipment

AND ANOTHER COMPLETE PLANT

FOR CHLORINE AND CAUSTIC SODA PRODUCTION

If you are interested in this new method of producing low cost, high purity chlorine and caustic soda, send for descriptive literature.

MATHIESON MERCURY CELL PROCESS PLANTS BY BLAW-KNOX ***offer these advantages in the production of*** **CHLORINE AND CAUSTIC SODA**

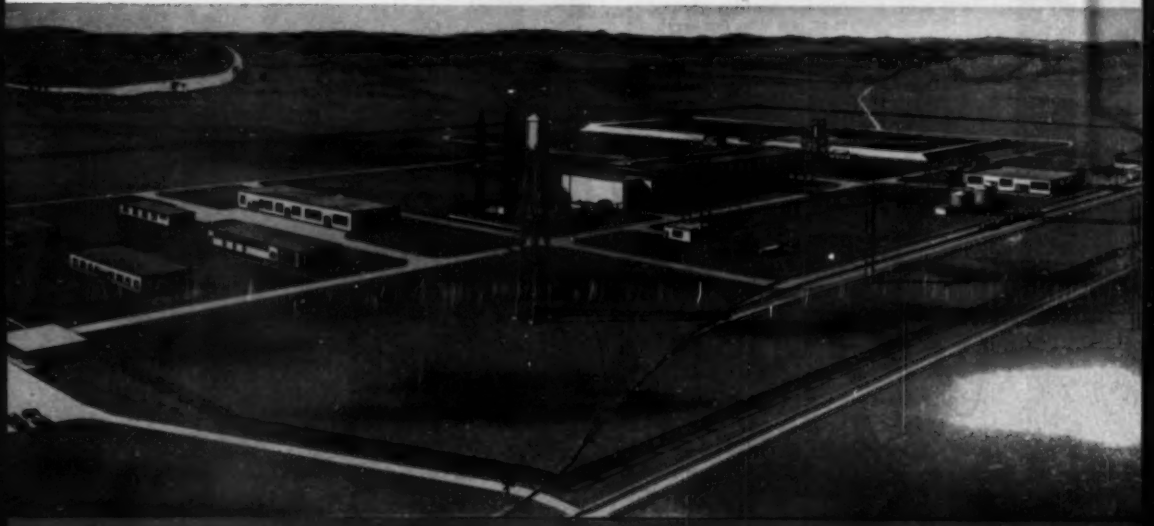
- ★ Large capacity cells, 12,000 to 30,000 amperes.
- ★ Pure caustic soda of 50% and up produced directly in the cells.
- ★ Guaranteed performance. High efficiency, low cost.
- ★ Simplified process design.
- ★ One piece cell cover—a single joint for easy disassembly.
- ★ Well-engineered plant layouts to fit individual conditions.
- ★ American development—result of 50 years experience in mercury cell operation.

CHEMICAL PLANTS DIVISION

BLAW-KNOX CONSTRUCTION COMPANY

PITTSBURGH • TULSA • NEW YORK • PHILADELPHIA

CHICAGO • BIRMINGHAM • WASHINGTON, D. C.



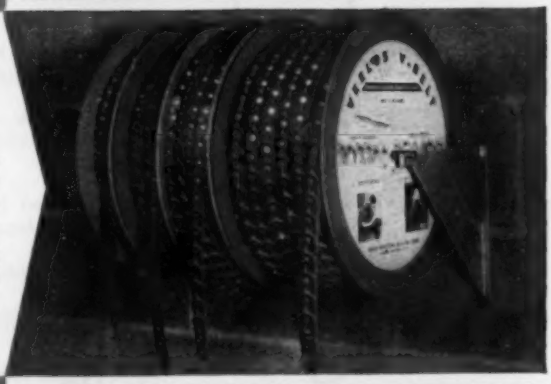
Drawing of another Mathieson Mercury Cell Plant now under construction

You Waste Money Here with Endless V-Belts...

because it takes *extra* dollars to keep a complete stock of different sizes of endless v-belts . . . *extra* dollars to provide adequate storage space . . . *extra* dollars to maintain an accurate inventory control . . . and *extra* dollars in an inventory of belts that may deteriorate before they can be put into service.

but You Save Money Here with Veelos V-Belt...

because these 4 reels of Veelos *adjustable* v-belt in the O, A, B and C widths will replace up to 316 sizes of endless v-belts. Veelos on reels is easy to store on the wall or floor . . . easy to control, for a glance tells you stock on hand. And Veelos holds inventory investment dollars to a minimum while providing *the right size v-belt when you need it*—without delay, without deterioration.



and You Make Money Here on Continuous Production...

because Veelos *keeps* your machines producing. Profit-killing downtime for belt installation is practically eliminated. Veelos installs quickly —on some drives in less than one-tenth the time of endless v-belts because it is unnecessary to dismantle outboard bearings. Simple adjustment permits easy maintenance of uniform tension on all belts . . . assures constant, vibrationless, full power delivery.

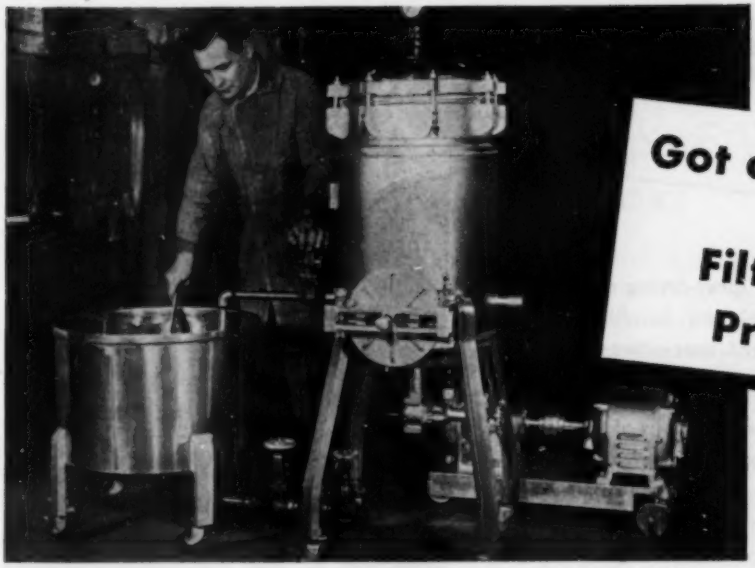
For the complete story on Veelos, the adjustable v-belt, write for your copy of the VEELOS DATA BOOK.

VEELOS
THE LINK
V-BELT

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof, static conducting. Also double V in A and B. Package on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

MANHEIM MANUFACTURING & BELTING COMPANY, MANHEIM, PA.



Got a **BIG** Filtration Problem?

Test it first—*at low cost* with a NIAGARA Pilot Filter

A Rented Pilot Filter Gives You the Facts on:

- **Filterability of new products**
- **Flow rates per unit filter area**
- **Clarity of filtrate under various conditions**
- **Ideal cycle lengths**
- **Best cake-washing methods**
- **What filter-aid to use**
- **Optimum filter-aid quantities**
- **Adaptability of filter to your process**
- **Filtration cost comparisons**

Thinking of going to modern high-speed pressure filtration? For a moderate rental fee, one of these complete Niagara pilot filters will give you accurate test data, upon which you can safely select plant-scale filtration equipment.

Made of Type 316 stainless steel at all liquid contact points, the pilot filter can be rented with or without steam jacket and stainless accessories shown. It demonstrates in your own plant the simplicity of operation, high filtration rates, and labor and maintenance economies you get with modern, totally-enclosed pressure-leaf filters.

For details on this rental service, send the coupon or write us today.

Niagara Filter CORPORATION

IN EUROPE—NIAGARA FILTERS EUROPE, 36 Leidsegracht, Amsterdam-C, Holland

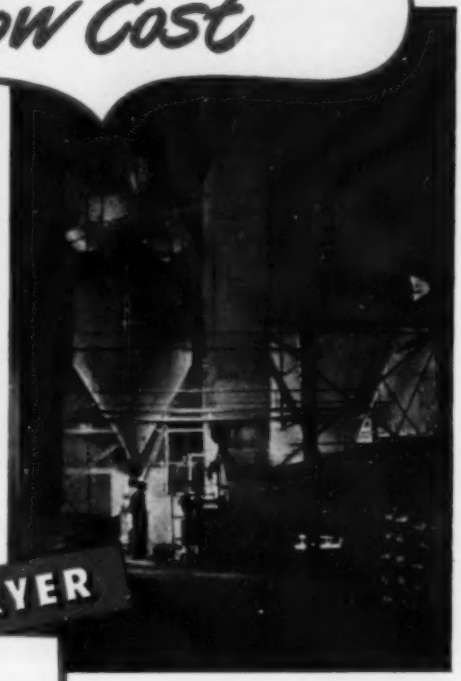
NIAGARA FILTER CORP., 3987 Main St., Buffalo 14, N.Y.
Please send details on Niagara Pilot Filter rental.

Name_____
Title_____
Company_____
Address_____
City_____ Zone____ State____

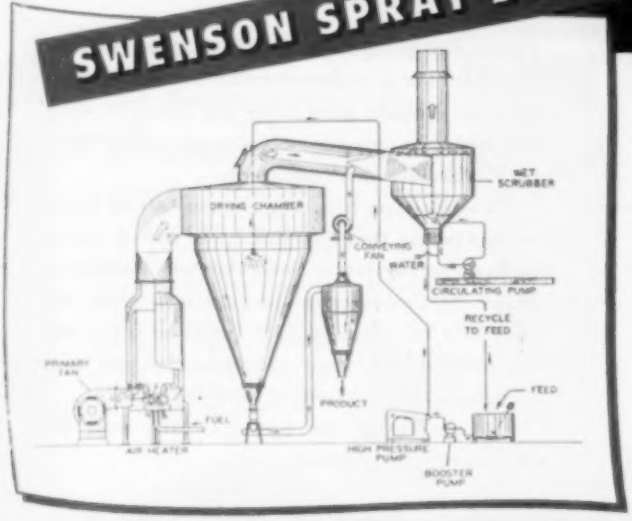
for DRYING HEAVY CHEMICALS at Low Cost

Here is high-capacity spray-drying equipment that is especially suitable for handling heavy chemicals. It is direct fired, uses either oil or gas as fuel, and gives amazingly low-cost operation.

It is but one of many applications of Swenson* Spray Dryers in the process industries. We will welcome an opportunity to assist you in adapting this equipment to your particular drying problems. Have you sent for our descriptive Bulletin D-105?



SWENSON SPRAY DRYER



Flow sheet shows typical spray-dryer installation for handling heavy chemicals.

Direct-fired spray drying may be used for such materials as:

Silica gel

Kaolin clay

Manganese sulfate

Calcium carbonate

Chrome sulfate

Sodium phosphate

*Reg. U. S. Pat. Off.

SWENSON EVAPORATOR CO.
DIVISION OF WHITING CORPORATION
15669 Lathrop Avenue Harvey, Illinois
Eastern Sales Office and Export Department: 30 Church Street, New York 7, N. Y.
In Canada: Whiting Corporation (Canada) Ltd., 47-49 LaPlante Ave., Toronto 2

Engineers report:

"No Durco Type F Valve has ever stuck!"

A year and a half of careful checking of several thousand Type F valves in actual installations has not revealed a single case of sticking. Even in the toughest chemical service, the Teflon sleeve prevents freezing and insures ready operation.

Let us send you all facts about this sturdy, simple corrosion resisting valve.

DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

A product of
The Duriron Company, Inc.
Dayton, Ohio

Manufacturers of corrosion resisting equipment exclusively since 1912.

Sizes: ¼" to 2"
Flanged ends

Sizes: ¼" to 2"
Screwed ends

Sampling valve
male or female
connection

Write for Bulletin 647

Corrosion is no problem —with POWELL VALVES

Corrosion *can be* a serious problem if a valve is not made of the correct materials to resist the chemical action of the fluid it must handle. But for any such problem, Powell can supply the answer—and the right valve. So why not consult Powell Engineers and be *right* from the start.

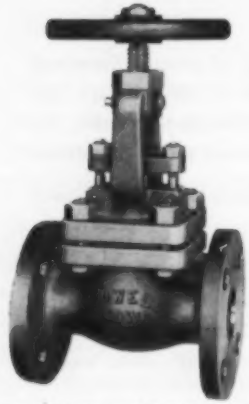


Fig. 2475—150-pound O. S. & Y. Globe Valve with flanged ends. Stem is threaded and guided through a bushing screwed into upper yoke. Plug type disc and seat can be easily reground, if necessary. Bolts and nuts are in Stainless Steel. Compression lubricant fitting in upper yoke. These valves conform to all the latest standards. Available in a large selection of corrosion resisting metals and alloys. Also made with screwed ends.

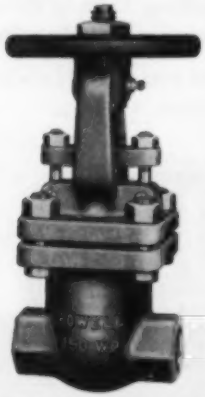


Fig. 2480—150-pound O. S. & Y. Gate Valve with screwed ends. Supplied with precision fitted, quickly interchangeable solid or split wedges. Stem is threaded and guided through a revolving bushing screwed into upper yoke which has a compression lubricant fitting. Can be furnished in a wide variety of corrosion-resisting metals and alloys. Also available with flanged ends.

Fig. 2197—Flanged end O. S. & Y. "Y" Valve for 150 pounds W. P. Can be furnished in various corrosion-resisting metals and alloys, with bolts and nuts in stainless steel. Flange dimensions and wall sections conform to ASA B-16e Standard. Sizes ½" to 2", incl. Screwed-end valves also available.

Fig. 1832—200-pound Stainless Steel Gate Valve. Screwed ends, screwed-in bonnet, inside screw rising stem. Available in many other corrosion-resisting metals and alloys.

Fig. 1848— Small 200-pound Swing Check Valve with screwed-in cap and regrindable, renewable disc. Available in a wide range of corrosion-resisting metals and alloys.

POWELL VALVES for CORROSION-RESISTANCE are available in the following metals and alloys

Stainless Alloys
18-8S
18-8S Mo.
18-8S Cb.
Misco "C"
Durimet 20
11.5-13.5% Cr. Iron
18% Cr. Iron
28% Cr. Iron
25% Cr. 12% Ni.

Alloy Steels
Carbon Steel
4-6% Cr. .5% Mo.
3.5% Nickel Steel
6-8% Cr. .5-.75% Mo.
8-10% Cr. 1.1-1.5% Mo.

Silver

Nickel and Nickel Alloys
Nickel
Monel Metal*
Inconel*
Hastelloy Alloys† (A, B, C and D)
Illium
D-10

Cast Irons
Cast Iron
3% Nickel Iron
Ni-resist*

Hard Lead

Bronzes—Acid, Aluminum, Silicon
Everdur
Herculoy
Ampco
Ampcoloy
76
90-10
88-10-2

Aluminum
Alcoa No. 43
Alcoa No. B-214
Alcoa No. 61 S-T

Molybdenum

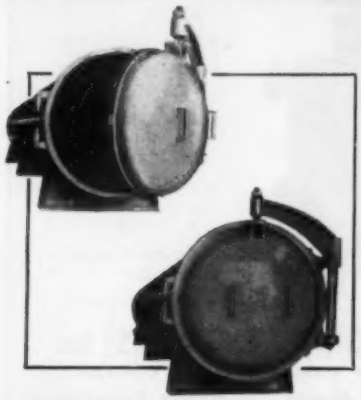
*Registered trade-names of the International Nickel Co., Inc.

†A registered trade-name of the Haynes-Stellite Co.

POWELL

The WM. POWELL CO., 2525 Spring Grove Ave., P. O. Box 106, Station B, Cincinnati 22, Ohio

"AN OPEN-AND-SHUT" PROPOSITION



BLAW-KNOX QUICK OPENING DOORS

for curing chambers, vulcanizers, and similar equipment, are *quick—tight—boltless.* In diameters up to 10 ft., they may be used on pressures up to 250 psi. They are rim-locking; manually or mechanically operated.

This is only one of a long line of Blaw-Knox standard equipment items for the Process Industries. See Blaw-Knox Bulletin No. 2355.

PROCESS EQUIPMENT DEPARTMENT

BLAW-KNOX

DIVISION OF BLAW-KNOX COMPANY

2090 FARMERS BANK BUILDING, PITTSBURGH 22, PA.

Other Offices in Principal Cities

LESLIE MADE SELF-CLEANING STRAINERS

Complete protection for Reducing Valves, Pump Governors, Temperature Regulators, Turbines, Pumps, Traps, Valves and other equipment against dirt, rust and scale is provided at lower cost by LESLIE Self-Cleaning Strainers.

Protection from foreign matter increases the life of the equipment and prevents costly down-time. Self-Cleaning feature allows cleaning of screen without removal from strainer body or shutting off operating fluid.

Available in sizes (1¼"-10"), in cast iron, cast bronze, cast steel, carbon moly, chrome moly and stainless steel, with screwed, flanged or socket welding connections, to 1500 lbs. press., 1000°F.

Stocked and sold by Industrial Distributors.

ESTABLISHED 1905 LESLIE CO.

SEND FOR—Bulletin No. 465
279 Grant Avenue Lyndhurst, New Jersey

PRESSURE REDUCING VALVES • PRESSURE CONTROLLERS
FLOATLESS LEVEL CONTROLS • PUMP GOVERNORS
TEMPERATURE REGULATORS • SELF CLEANING STRAINERS
AIR HORNS • STEAM WHISTLES

STEAM FOR HEAT OR PROCESS

A complete steam plant backed by undivided responsibility • Shipped completely assembled • More than 80% thermal efficiency guaranteed • 4-pass design provides 5 sq. ft. of heating surface per b.h.p. • Built-in induced draft eliminates need of expensive chimney • Simple installation • Clean, quiet operation • Heavy-duty construction assures long-lived dependability

Superior Steam Generators are manufactured in 18 sizes from 20 to 600 b.h.p. for pressures up to 250 p.s.i. or for hot water heating.

For complete details, write for Catalog 322

Factory: Emmaus, Pa.

Exec. Offices: Times Bldg., Times Sq., New York 18, N. Y.

SUPERIOR STEAM GENERATORS

CLEANS
Fouled Heat Exchanger Tubes QUICKLY...

WILSON
TP-301 CLEANER

This high speed tube cleaner is designed to increase output and minimize down-time. The improved Model TP-301 is the only tube cleaner which can remove deposits from completely plugged heat exchanger tubes . . . and other fouled straight tubes heretofore not considered practical to clean.

Many improvements, resulting from years of field experience, have been built into the new TP-301 cleaner.

- **MORE POWERFUL**—operating speed up to 3300 RPM at 90 psi utilizing 130 cfm.
- **LIGHTER WEIGHT**—only 15 lb.
- **SHORTER**—only 13" overall.
- **INCREASED CAPACITY**—from ⅜" up to 2½" or even 3" O.D. tubes up to 40 ft. in length.
- **LOW AIR PRESSURE**—operates on air pressure as low as 50 lb.
- **LOW HEAD ROOM NEEDED**—minimum practical working head room 5 ft.
- **COSTS LESS** than previous models.

VARIOUS CARBIDE BITS AVAILABLE

Send for Bulletin giving complete details on this man-hour and money-saving tube cleaner

WILSONIZE TO ECONOMIZE

THOMAS C. WILSON, INC. 21-11 44th AVENUE, LONG ISLAND CITY, N.Y.

CABLE "TUBECLEAN" NEW YORK

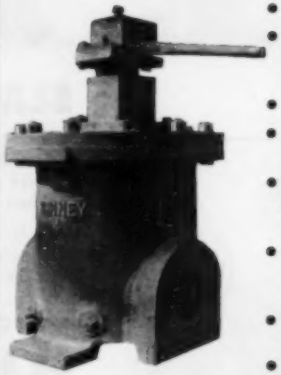
TW-7044

WILSON
TUBE CLEANERS · TUBE EXPANDERS

REPLACE THAT BASKET STRAINER

With A

KINNEY MANUALLY OPERATED SELF-CLEANING STRAINER



- SELF CLEANING
- STRAINER ELEMENT MANUALLY OPERATED
- NO DOORS TO OPEN
- NO BASKETS TO CHANGE
- STRAINERS FOR WATER, OIL, AND VARIOUS OTHER CHEMICALS
- WIDE VARIETY OF STRAINER MEDIA AVAILABLE
- MOUNTED IN ANY POSITION
- EASILY INSTALLED

S. P. KINNEY ENGINEERS, Inc.

ENGINEERS • MANUFACTURERS • CONSTRUCTORS

201 Second Avenue Carnegie, Pennsylvania

LUBRICATION ECONOMY

LUBRIPLATE LUBRICANT
Saves Gears and Transmissions

So says the AUTOMATIC WASHER COMPANY. *"We have used LUBRIPLATE in our washing machine transmissions since 1933. Our laboratory tests as well as field experience indicate that through the use of LUBRIPLATE we reduce the wear on the gears and prolong the life of the transmission. It has been an important factor in the success of our product."*

1. LUBRIPLATE reduces friction and wear
2. LUBRIPLATE prevents rust and corrosion
3. LUBRIPLATE is economical to use

Write today for case histories of savings made through the use of LUBRIPLATE in your industry.

LUBRIPLATE DIVISION
Fiske Brothers Refining Co.
Newark 5, N.J. Toledo 5, Ohio

The Different LUBRICANT!

DEALERS EVERYWHERE, consult your Classified Telephone Book

How critical can you be?

Taylor forged and rolled steel products used in pressure vessel and boiler drum construction—welding type nozzles with extended necks, manways with extended necks, and flanges, including carbon flange and blind flange.

You certainly have a right to be as critical as your requirements, and if those requirements happen to include pressure vessel outlets they are critical indeed.

But not too critical for Taylor Forge!

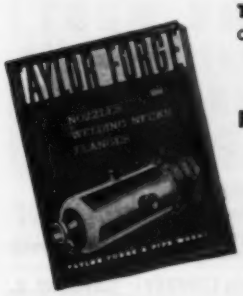
Typical Taylor Forge pressure vessel outlet fittings are illustrated above — nozzles, manways, welding necks, and related flanges. They are the embodiment of Taylor Forge engineering research and forging technique.

But whether it is the nozzle at the pressure vessel or the WeldELL or other Taylor Forge Fitting on the line, it always expresses the uncompromising standards of Taylor Forge.

How critical should you be? Just critical enough to insist on the best welding fittings all the way through, and that means Taylor Forge.

TAYLOR FORGE

Taylor Forge & Pipe Works • General Offices and Works: P.O. Box 485, Chicago 90, Ill.
Offices in all principal cities • Plants at Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada



Facts on pressure vessel outlets—This 118-page book covers nozzles, necks, manways and large diameter flanges; includes data on TEMA Standards and section on modern flange design. Coupon brings you copy.

☐ Send copy of Pressure vessel catalog No. 501. 513-0915
☐ Send copy of welding fitting and flange catalog.

NAME_____
POSITION_____
COMPANY_____
STREET ADDRESS_____
CITY_____ ZONE____ STATE_____

Mail to Taylor Forge & Pipe Works, P. O. Box 485, Chicago 90, Ill.

NEW

WILLSON®

DUST HOOD

Lightweight and Comfortable

Can be used with any WILLSON single filter respirators for dusts, mists, gases, vapors. Available without respirator.

Wide Vision, acetate windows – 33 square inches.

Windows interchangeable, replaced in a matter of seconds.

Canvas hood with snap fasteners on window.

Style 1

Style 2 with No. 44 Respirator

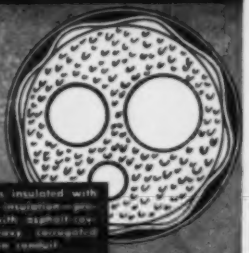
Straps with spring clips to gather hood around body and under arms.

See your WILLSON distributor or write us direct

WILLSON PRODUCTS, INC., 106 Thorn Street, Reading, Pa.

Dependable Products Since 1870

PROTECTION

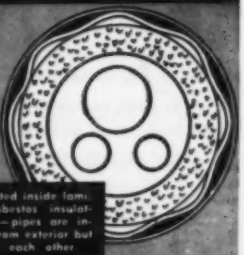


All pipes insulated with molded insulation—protected with asphalt-covered heavy corrugated rigid iron conduit.

ENGINEERING

Sectional insulation of any specification applied to individual pipes—protected with asphalt-covered iron conduit.

INSULATING KNOW-HOW



Pipes nested inside laminated asbestos insulating liner—pipes are insulated from exterior but not from each other.

make Ric·wiL the ONE BEST IN PREFABRICATED INSULATED PIPING

Ric·wiL PREFABRICATED INSULATED PIPING

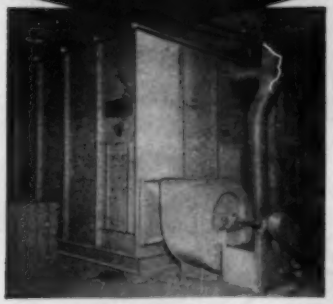
UNDERGROUND OR OVERHEAD

THE RIC-WIL COMPANY · CLEVELAND, O.

SLY

PIONEERS AND LEADERS IN

DUST CONTROL



A typical Sly dust control installation in a cement plant. Hundreds of Sly Dust Filters in cement plants collect dust generated in such operations as crushing, grinding, screening, conveying, loading and packing—saving valuable materials, adding to net income.

Your Dust Problem Solved

- EFFECTIVELY—
- INEXPENSIVELY

We've found that people often *endure* dust for years before they investigate and find out how effectively and inexpensively dust can be controlled.

In this business of dust control—like many others—experience is the best teacher. We have been learning for 50 years—and still are.

With thousands of installations, we have a wealth of experience in all industries. We'd like to share this wealth by discussing your particular problem with you. Sly representatives are trained and experienced engineers.

There's no obligation involved. You may be agreeably surprised at how *effectively* and *inexpensively* your dust problem can be solved. Ask for Bulletin 98.

THE W. W. SLY MANUFACTURING CO.

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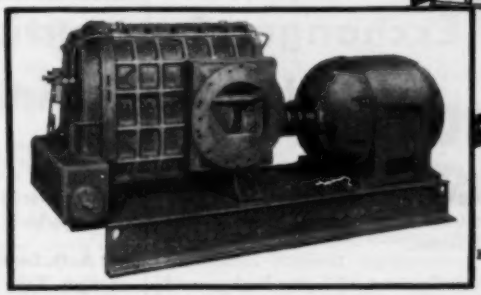
Minneapolis • Birmingham • Cincinnati • Lansing
Los Angeles • Rochester • Toronto

Wherever AIR or GAS is used Investigate STANDARDAIRE

AXIAL FLOW BLOWERS

READ STANDARD'S engineered-for-production program has resulted in the acceptance of Standardaire Blowers for virtually every important industry. Blowers are currently being produced for a wide range of applications in a rapidly expanding market — and in many instances to suit specific requirements and specifications. The amazing acceptance of Standardaire Blowers is indicative of their superior operating characteristics, high efficiency and dependable performance in round-the-clock service. For further details we invite you to consult with our engineers. They will be glad to study your air or gas problems and make recommendations. Write Dept. E34

READ STANDARD CORPORATION,
370 Lexington Ave., New York 17, N. Y.



Standardaire 1216R23 Blower to deliver 2850 c.f.m. at 1160 r.p.m.

Engineers like the STANDARDAIRE principle

RECENT BLOWER USERS: Amalgamated Sugar Company • Brillo Manufacturing Co., Inc. • Chicago Pump Co. • Cleaver-Brooks Company • Dow Chemical of Canada, Ltd. • E. I. DuPont de Nemours & Co. • Fairbanks, Morse & Company • Hercules Powder Co., Inc. • Hills Bros. Coffee, Inc. • Husky Oil Co. • Koppers Company, Inc. Monsanto Chemical • National Advisory Committee for Aeronautics • Ozark-Mahoning Co. • United States Navy • Standard Brands, Inc. • West Jersey Paper Manufacturing Co.

BLOWER-STOKER DIVISION

FORMERLY The Standard Stoker Co., Inc.
ONLY THE NAME IS CHANGED

READ STANDARD
CORPORATION

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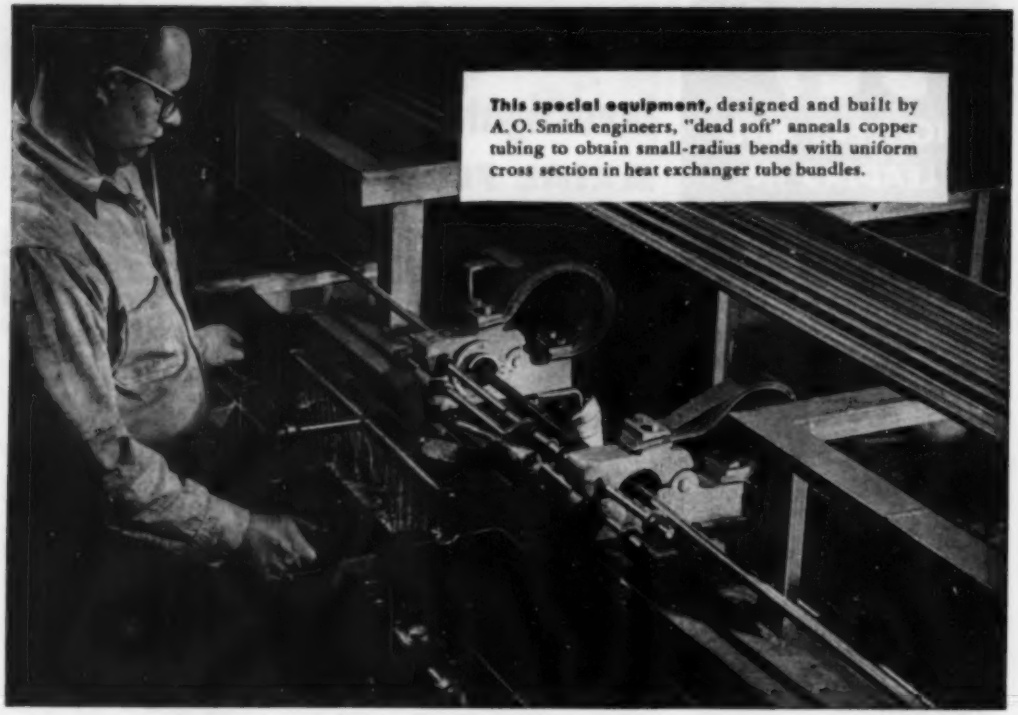

This special equipment, designed and built by A. O. Smith engineers, "dead soft" anneals copper tubing to obtain small-radius bends with uniform cross section in heat exchanger tube bundles.

Heat Exchanger Construction Improved with Unique Equipment

Heat exchangers frequently require special design and construction features for their specific process applications.

A. O. Smith can draw on a 77-year background of experience and some 300 engineers and technicians to solve these special problems.

Here you see an application of electric resistance heating of tube areas to be bent. The immediate advantage is closely controlled zone heating which can be done faster, more uniformly, and with less scaling of the tube, than with some other methods of heating.

Let A. O. Smith design and build your heat exchanger. Take advantage of our extensive experience in thermal design, engineering, metallurgy, welding and fabricating.

Facilities as well as the skill to satisfy your most exacting requirements are here . . . feel free to call on A. O. Smith when confronted with a heat exchanger problem.

77th ANNIVERSARY 1874 - 1951

A.O.Smith

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Atlanta 3 • Boston 16 • Chicago 4 • Cleveland 13 • Dallas 2
Houston 2 • Los Angeles 12 • New York 17 • Philadelphia 3
Phoenix 2 • Pittsburgh 19 • Salt Lake City 1 • San Diego 1
Seattle 1 • Tulsa 3 • Washington 6, D.C.
International Division: Milwaukee 1

"TROUBLE FREE"
Control . . .

TRERICE

SELF-OPERATING REGULATORS
and DIAL THERMOMETERS

Constant Temperature Regulation for

• HOT WATER TANKS • PASTEURIZERS • PRE-HEATERS
• STORAGE ROOMS • VATS • PLATING TANKS
• COOKERS • FEED WATER HEATERS • WATER JACKETS

Cut your processing costs to a new low with the Trerice Self-Operating Regulator. This dependable, experience-proven regulator provides trouble-free control . . . eliminates over-heating! Saves you steam, fuel and labor while affording improved "quality control" over your product. Your low, initial investment in the Trerice Self-Operating Regulator and its companion piece, the Trerice Dial Thermometer, will be repaid many times over during their first year of service.

WRITE DEPT. A-16 FOR BULLETINS 500 AND 1000

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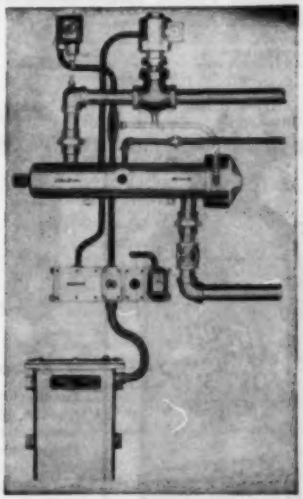

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World's best all-purpose extinguishers. Safe on electrical fires, effective on flammable liquid fires. 1 qt., 1½ qt. (at left) pump types; 2 qt., 1 gal. pressure types.

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Couple playpipe to hose line. 19 gals. of water and 1 gal. of Pyrene Foam Compound yield 200 gals. of foam. For flammable liquid fires and ordinary combustibles. Also air foam systems.

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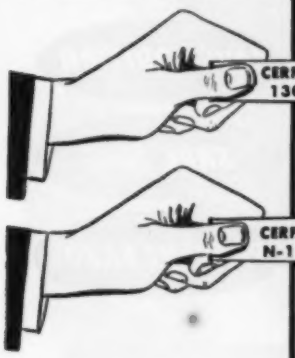

HOUGHTON SURFACE ACTIVE AGENTS

		CHEMICAL CLASSIFICATION	PROPERTIES AND USES
DETERGENCY & WETTING	CERFAK	Alkyl aromatic sulfonate Anionic—(Flake Type)	Used over full pH range for detergency and/or wetting. Also for compounding cleaning agents.
	CERFAK 1300	Polyoxyethylenealkyl thioether—non-ionic (Liquid)	Concentrated detergent and wetting agent, effective over full pH and temperature range at low concentrations. Okay in hard or soft water.
	CERFAK 1303	Non-ionic thioether (Liquid)	Detergent and wetting agent, having low sudsing property, suitable for continuous boiling and scouring.
COMBINED DETERGENCY & WETTING	CERFAK 453	Blend of anionic and non-ionic agents (Liquid)	[illegible] Rapid wetting speed, excellent rewetting ability, good scouring ability.
	CERFAK N-100	Amine condensate (Liquid)	Combined detergency and wetting action. Use with low per cent of alkaline salt. Good for all types of alkaline scouring.
	CERFAK N-115	Blend of non-ionic agents—(Liquid)	Excellent for scouring and dyeing woolen and worsted yarns and piece goods. Generally applicable as a detergent.
WETTING & REWETTING	SURFAX 1288	Alkylaroyl sulfopropionic ester—(Liquid)	Concentrated wetting [illegible] neutral or mildly alkaline solutions for very fast wetting. Excellent dye bath constant. An exclusive Houghton research development.
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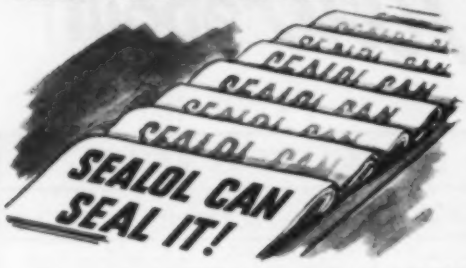

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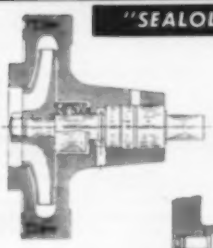
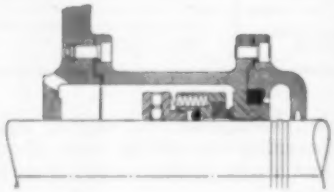
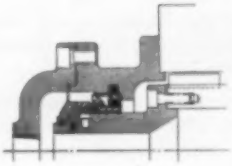


"SEALOL"
FCB Water Pump Seal (water 55 PSI, 3400RPM)



"SEALOL"
Chemical Pump Seal (dye liquor 20 PSI, 1750 RPM)



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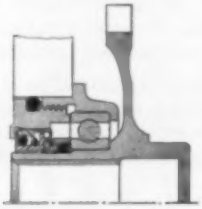

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In the illustration the manometers measure the upstream pressure at the orifice plates in gas and air lines leading to equipment under test. At test stations in this plant they also measure the pressure of gas and air for test units.

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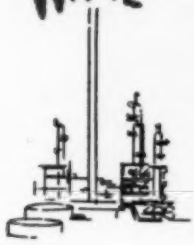
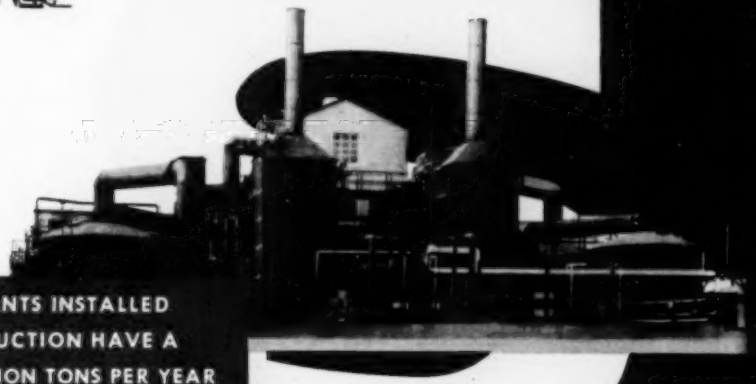
don't WASTE sulfur





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. . . and they no longer waste sulfur. Several companies are now recovering sulfur from waste sour gases in large quantities—as much as 300 tons per day in one refinery alone—with Foster Wheeler Sulfur Recovery Equipment.

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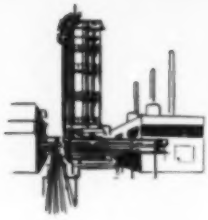

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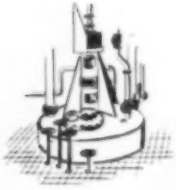

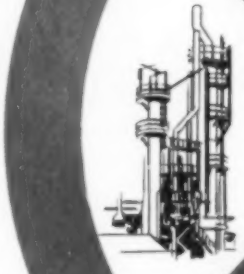

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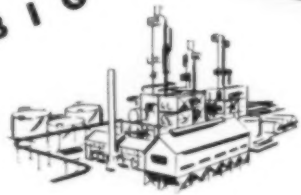

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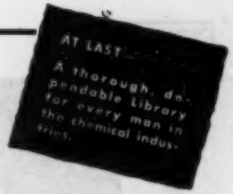

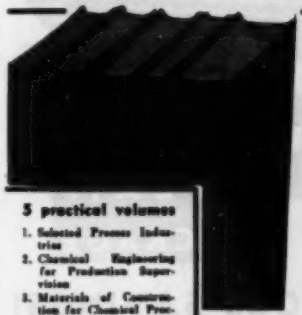

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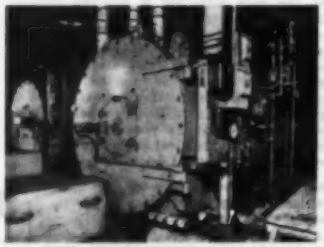

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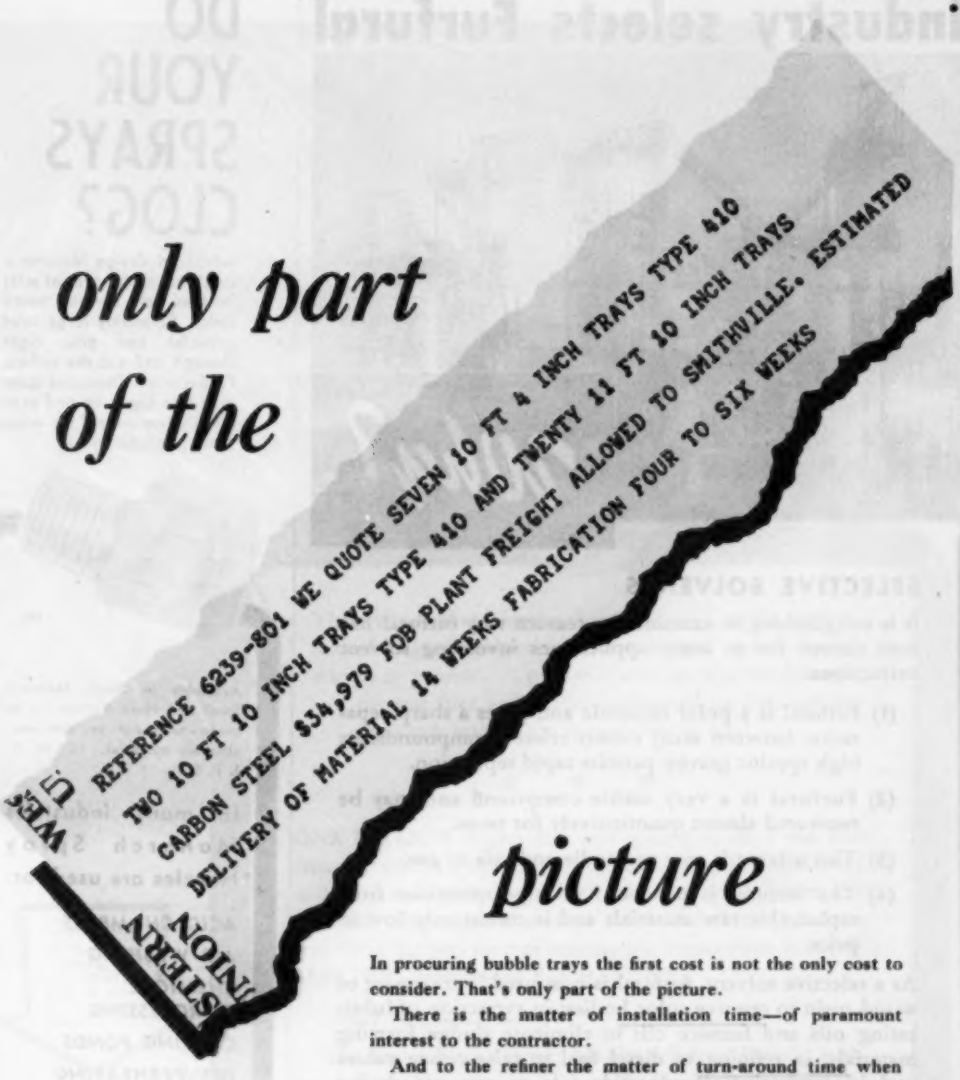
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It is enlightening to examine the reasons why furfural has been chosen for so many applications involving solvent extractions.

(1) Furfural is a polar molecule and gives a sharp separation between many closely related compounds. Its high specific gravity permits rapid separation.

(2) Furfural is a very stable compound and may be recovered almost quantitatively for reuse.

(3) This solvent is easy to handle and safe to use.

(4) The furfural is produced in large quantities from replaceable raw materials and is consistently low in price.

As a selective solvent, furfural is now used in treatment of wood rosin to remove color bodies; in extraction of lubricating oils and furnace oils to eliminate sludge forming materials; in refining of diesel fuel to raise cetane values and in processing of glyceride oils to separate drying from non-drying portions. In a modified technique, it is used as an extractive distillation agent for separating C-4 hydrocarbons.

Many mixtures lend themselves to selective solvent refining. If you would like to know more about the techniques employed, write for our Bulletin SS.

The Quaker Oats Company — CHEMICALS DEPT.

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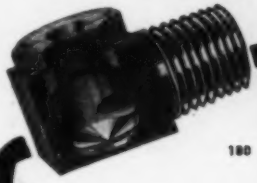

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The Perma-Plate Magnet handles solids or liquids, withstands high temperatures, and can be installed anywhere. Its magnetic strength is *certified*. There is a size and strength ideal for any job you have in mind. Get details now.

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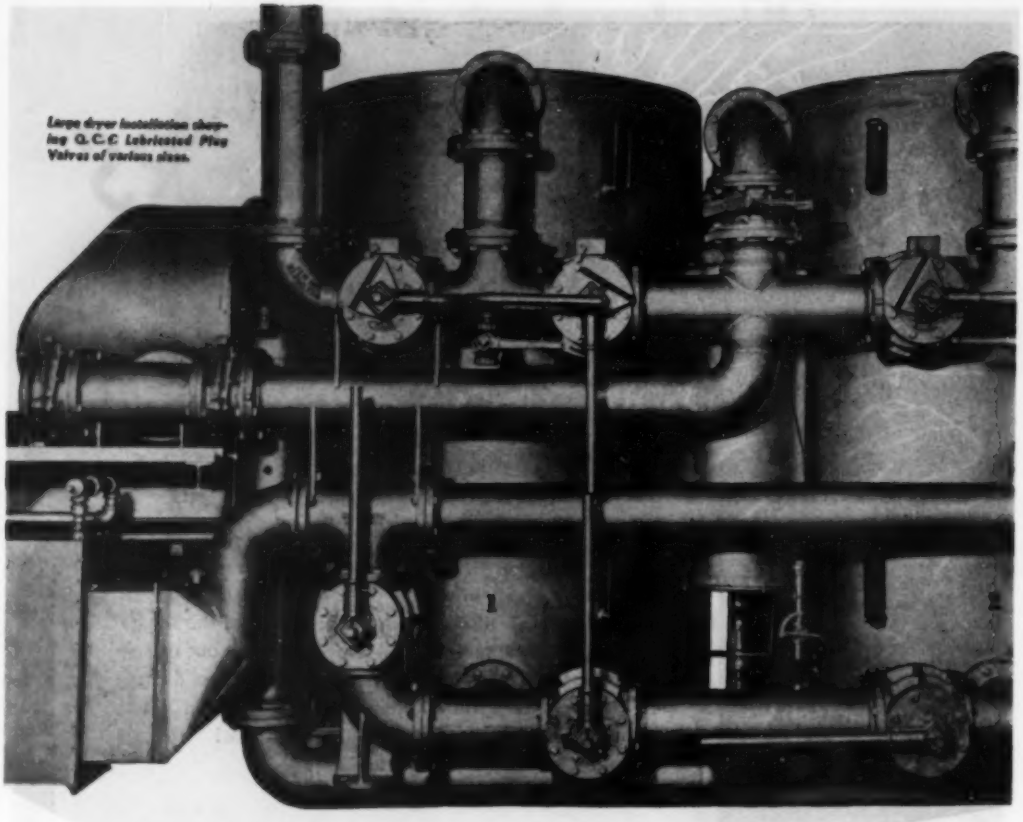

Large dryer installation showing A.C.F. Lubricated Plug Valves of various sizes.

QUICK CONTROL AT CAPACITY FLOW

Many industrial processes require full pipe line capacity of fluids—for economical, efficient operation... and at the same time quick control. For such service, A.C.F. CYLINDRICAL Lubricated Plug Valves are the answer—straight-through full pipe area flow with quick, quarter-turn, tight shut-off. Only A.C.F. Valves have all these features.

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FOR THE CITY OF

TOMS RIVER, New Jersey

With her population more than doubling during the summer season, the resort city of Toms River, New Jersey was facing a serious water shortage. Five old, inefficient and not too dependable wells were being operated with suction pumps. Layne was called in for a discussion of what could be done with limited funds. Layne's recommendations resulted in a contract for the rebuilding and re-equipping of one old well and the drilling and equipping of a new one. The contract also called for an auxiliary, gasoline engine drive on one of the pumps for use in case of electric power failure. Without delay everything was finished according to the contract, giving the city of Toms River a water supply that more than fulfills their present needs.

Layne handled everything complete in one inclusive contract that saved the city officials much time, useless expense and unnecessary worry. Layne offers this same type of service to any city or industrial plant in need of more well water.

NEW CATALOGS

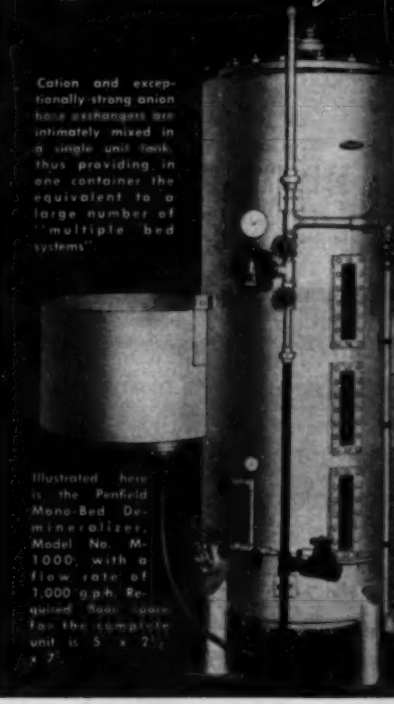
Layne offers, without obligation, a wide range of catalogs and bulletins on well water systems, short coupled service pumps, oil and water lubricated pumps, irrigation wells and pumps, etc. You may obtain copies by addressing

LAYNE & BOWLER, INC.
General Offices, Memphis 8, Tenn.

Layne
WATER SUPPLY
WELLS & PUMPS

Penfield **MONO-BED DEMINERALIZER**

Cuts Deionization Costs



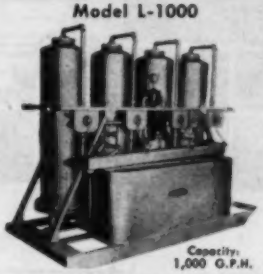
Cation and exceptionally strong anion base exchangers are intimately mixed in a single unit tank, thus providing, in one container the equivalent to a large number of "multiple bed systems"

The raw water passes through the Penfield Mono-Bed Column only once, and with a mineral content of virtually zero resistance, have been reported as high as 20,000,000 ohms per centimeter.

Illustrated here is the Penfield Mono-Bed Demineralizer, Model No. M-1000, with a flow rate of 1,000 g.p.h. Required floor space for the complete unit is 5' x 2½' x 7'.

Regeneration is accomplished by the simplest and most economical method known — gravity and displacement. No water pressure is required and there are a minimum of valves to operate.

Model L-1000



Capacity, 1,000 G.P.H.

Over the past ten years, Penfield has built more four column demineralizers than any other manufacturing concern. In comparison to distilled water costs, Penfield Industrial Demineralizers provide savings as high as 85% and in one reported instance cut costs 90%. No heat or steam power is ever required and units are ready for immediate operation on arrival at site. Send for "Penfield Pays" folio giving specifications of all Penfield Demineralizing units — single, double and four column.

AVAILABLE IN FLOW RATES FROM 200 TO 5,000 G.P.H. AND UP

The Penfield Mono-Bed Demineralizer operates upon the most efficient deionizing technique known . . . is ideal for a large variety of processing and other operations — including power plants, mirror plating, electronic tubes, photographic finishing, *and wherever exceptionally high purity, mineral-free water is required.*

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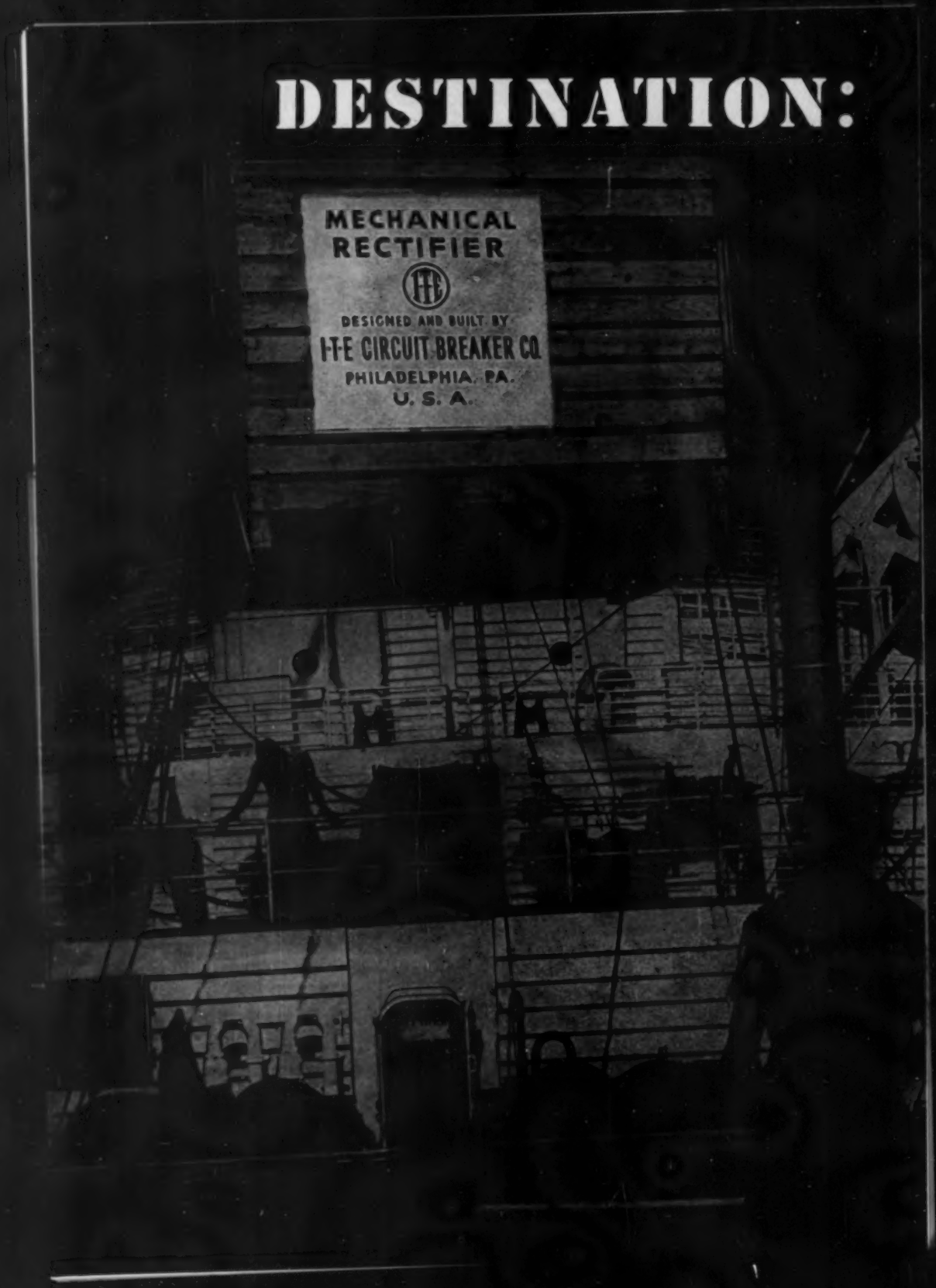

MANILA

I-T-E Mechanical Rectifier to Provide D-C Power for Philippine Chlorine Production

Otto Jensen (right), manager of the Rectifier Division, I-T-E Circuit Breaker Company, Philadelphia, explains cathode ray oscilloscope reading of contact timing on new mechanical rectifier installation for the Superior Gas and Equipment Company, Manila, Philippine Islands. Observing the demonstration are (left to right) D. Tiosejo, Vice President of the Philippine company; H. G. Noordberg, Vice President; and B. D. Van Eyck, Industrial Equipment Manager, Philips Export Corporation of New York.

PHILADELPHIA: A step toward making the Philippines independent of outside chlorine supplies was taken recently when the first I-T-E Mechanical Rectifier manufactured for export was shipped to Manila from the Port of Philadelphia.

The rectifier will be put into operation this fall in a new $700,000 chlorine plant near Manila. The plant will produce an estimated six tons of chlorine daily for water chlorination, bleaching, and civil defense purposes.

Designed to produce an uninterrupted source of d-c power for plant operation, the rectifying equipment has a rating of 12,000 amperes at 65 volts.

The rectifier was purchased through Philips Export Corporation, New York City, by the Superior Gas and Equipment Company, Manila, whose Chief Engineer and Director, M. I. Felizardo, and Vice President, D. Tiosejo, supervised acceptance tests at the I-T-E Philadelphia plant.

Deciding factors in Superior's selection of rectifying equipment were the mechanical rectifier's high inherent efficiency (96.6%), the small space requirement, low maintenance cost, and ease of operation.

I-T-E Mechanical Rectifiers are available in units rated from 4,000 to 10,000 amperes, in any voltage from 50 to 400 volts d-c. Primary voltages, 2,300 to 22,000, three-phase a-c.

I-T-E Bulletin 5106 contains complete technical information on the Mechanical Rectifier, including a detailed presentation of operating principles. Send for it today. I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pa.

The ITE Company

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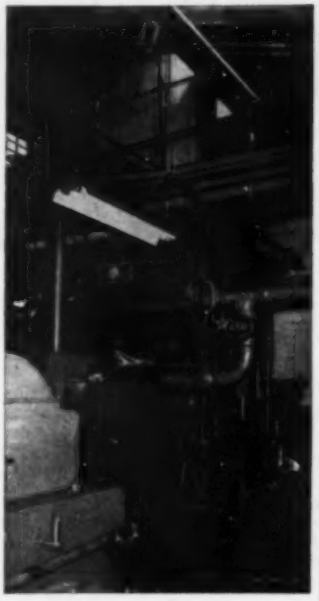
● You can cool air, gas, water, oils, chemicals, electric and power and process equipment, engines, mechanical processes with lower cost and really accurate control of temperature with the Niagara Aero Heat Exchanger.

You are assured of uniform, constant production and quality from any process . . . steady, reliable operation . . . lower cost for more dependable cooling. You can have closed system cooling with freedom from scale, dirt, corrosion and maintenance troubles. You can accurately cool more than one type of liquid with one machine.

The Niagara Aero Heat Exchanger uses atmospheric air to cool liquids and gases by evaporative cooling. You can remove heat at the rate of input to keep accurate control of gas or liquid temperature. You can put heat back into the system to save the losses of a "warm-up" period or to equalize the effect of load variations.



Great savings in cooling water and savings in piping, pumping and power return the cost to you quickly. The Niagara Aero Heat Exchanger can save you approximately 95% of your cooling water cost. Write for Bulletin 96.

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. . . . up to $500 per year per filter! That's because FEON synthetic fabrics last from 10 to 12 times longer than the cotton cloths they've replaced in this pigment plant—and give better results, too. Here are the facts:

1. STRING DISCHARGE ROTARY FILTER: FEON 208 Nylon lasts a year under severe chemical conditions, compared to six weeks for cotton. Saves $500 a year.
2. SCRAPER DISCHARGE ROTARY FILTER: Light-weight, efficient FEON 208 Nylon under less severe chemical conditions replaces heavy cotton. Saves $150 a year.
3. FILTER PRESS: FEON 164 DYNEL gives 900% longer life than cotton fabrics, saves $2664 a year.
4. DUST COLLECTOR: FEON fabrics now under test are far outlasting other materials, promise extensive savings.

Savings like these may be possible in your plant! Try FEON now—filter cloths that last from 3 to thirty times longer—one source of supply for all needs—24-hour service. Send us the facts and figures on *your* job today. We'll be glad to quote prices and make recommendations.

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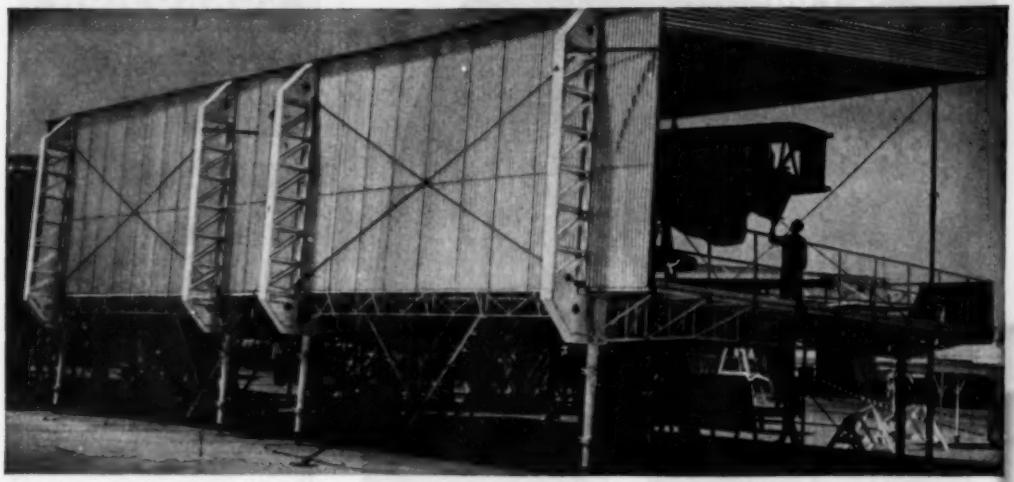

No Maintenance
for its roofing and siding

When Consolidated Vultee engineers designed a maintenance dock for the B-36D jet-augmented bomber, they naturally turned to the "aircraft metal" for the closed side and roof—rustproof, corrosion-resistant aluminum.

Reynolds *Lifetime* Aluminum Industrial Corrugated has ample strength for industrial use (see specifications). Yet it weighs only 56 lbs. per square. That's important in this structure that moves up and down on hydraulic jacks; it's important for framing economies in *any* structure. And aluminum's radiant heat reflectivity is another advantage—important under the California sun of this Lindbergh Field, San Diego, installation—important in *any* plant, to keep interiors cooler in summer and warmer in winter.

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• Offices in principal cities. Check your classified phone book for our listing under "Building Products," or write: Reynolds Metals Company, Building Products Division, 2005 South Ninth St., Louisville 1, Ky.

Aluminum is required for planes and other military needs. Reynolds *Lifetime* Aluminum Industrial Corrugated is still produced, but the total supply is necessarily reduced. DO-rated orders receive priority handling.

Specifications for Reynolds *Lifetime* Aluminum Industrial Corrugated:

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Corrugations 7/8" deep, 2-2/3" crown to crown
Uniform load support (roof) 80 p.s.f. on 4' purlin spacing
Uniform wind load capacity (siding) 20 p.s.f. on girt spacings up to 7'9"
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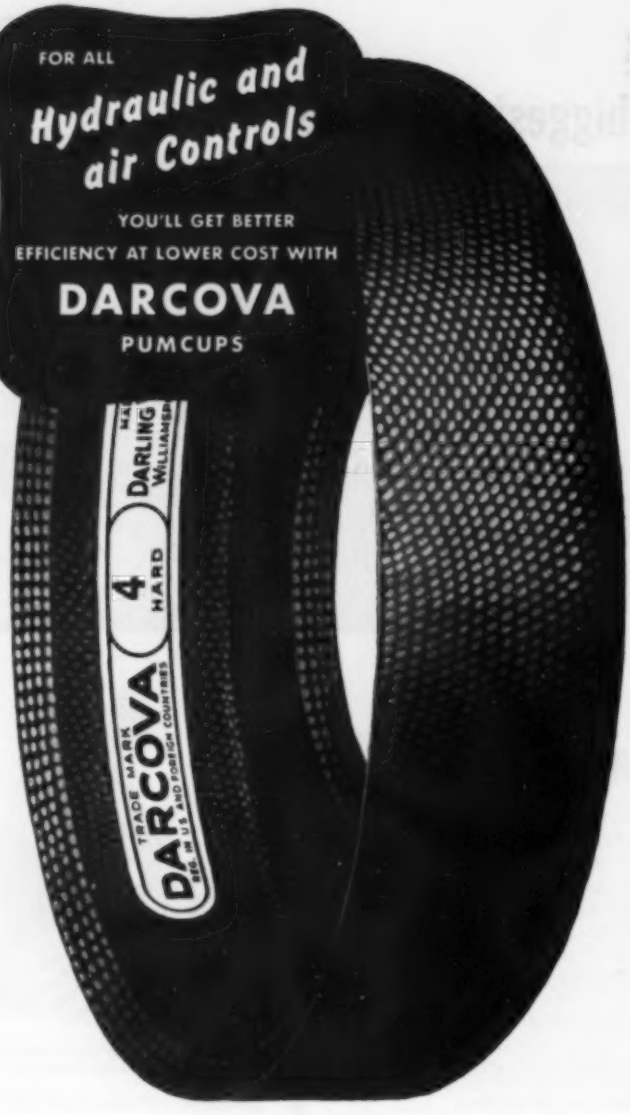

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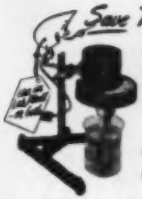

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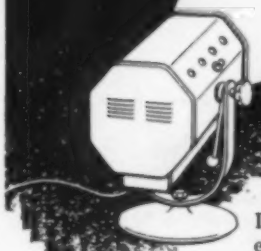

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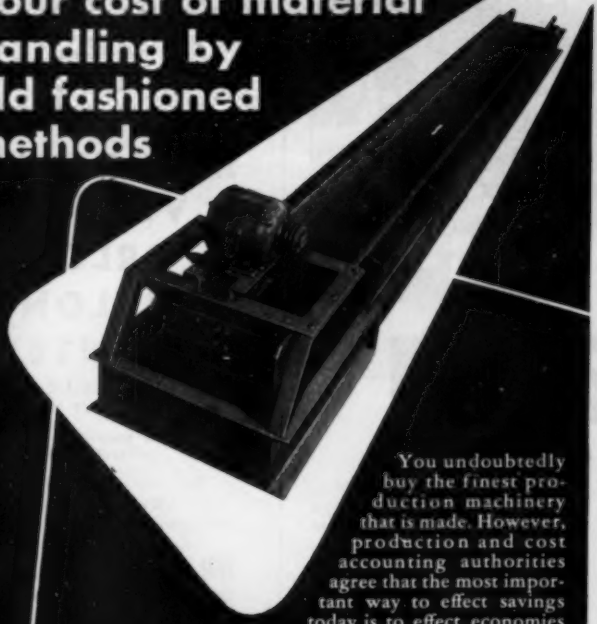

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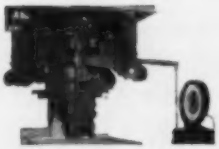

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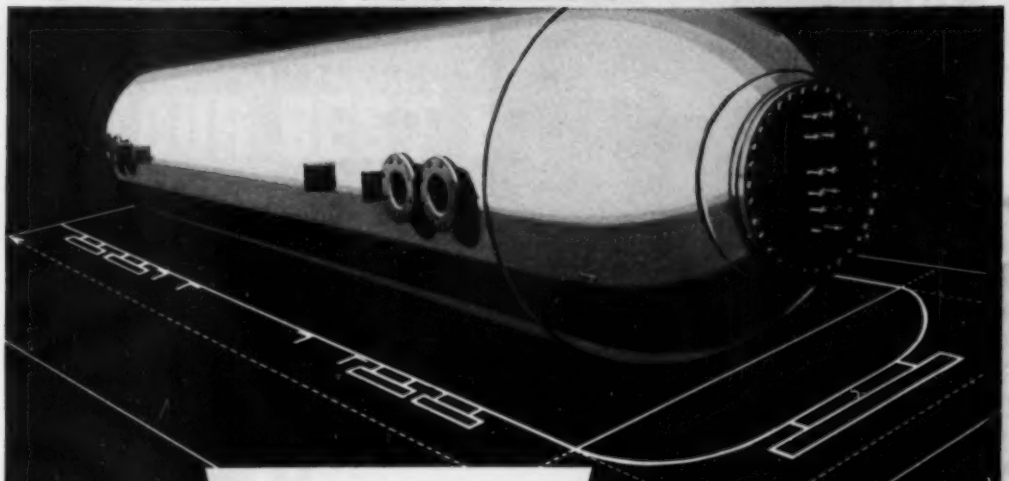

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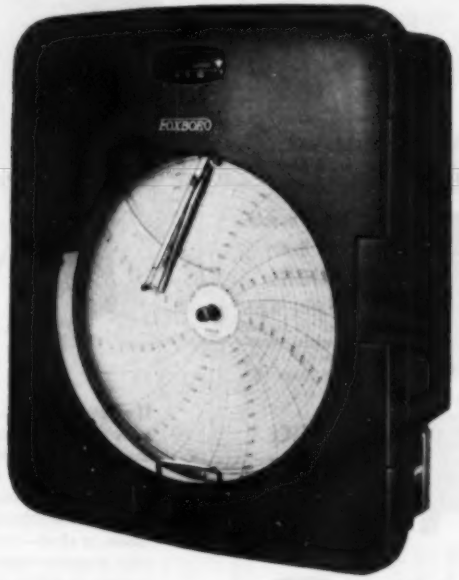

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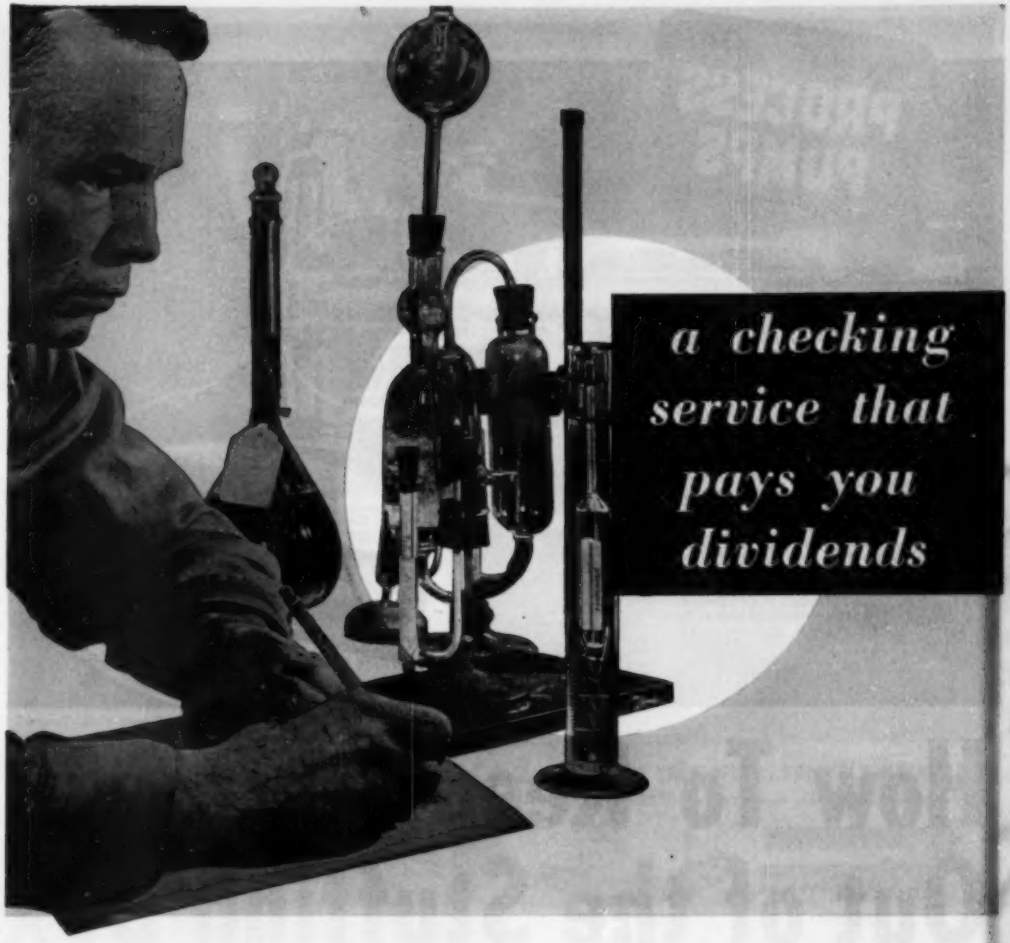

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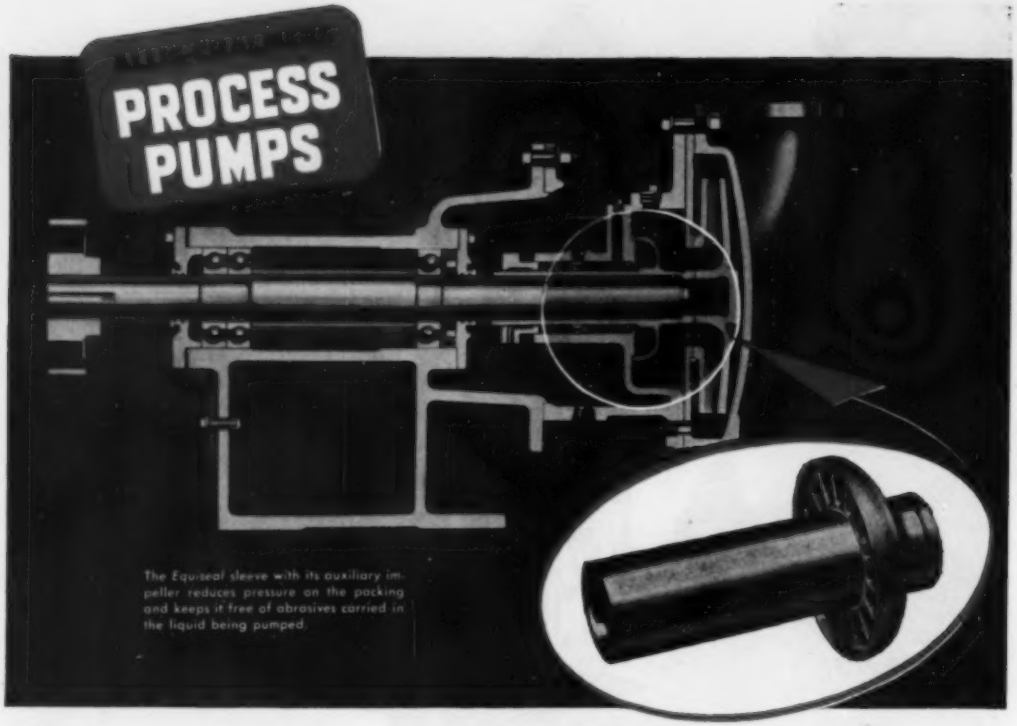
PROCESS
PUMPS
The Equiseal sleeve with its auxiliary impeller reduces pressure on the packing and keeps it free of abrasives carried in the liquid being pumped.

How To Keep Abrasives Out of the Stuffing Box

YOU CAN ELIMINATE abrasives-in-the-stuffing-box problems with an Allis-Chalmers Process Pump equipped with *Equiseal* stuffing box. This stuffing box arrangement consists of an auxiliary impeller like the one shown which produces a low pressure area in front of the packing. On all suction lifts and on suction heads up to fifteen feet, this pressure is zero. *None of the liquid being pumped enters the stuffing box.* None of the abrasive carried by the liquid enters the stuffing box.

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If you pump corrosives or abrasives, you should know about the Allis-Chalmers Process Pump with *Equiseal* stuffing box. Ask your Allis-Chalmers Authorized Dealer or District Office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 08B6615.

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to Conveyor Belt Users . . .

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(For general duty only)

STEP PLY CONSTRUCTION
(Gives better troughing action)

BREAKER STRIP CONSTRUCTION FOR EXTRA PROTECTION
(Against Heat or the Effects of Heavy Abrasive Loads)

NOTE: Conveyor Belt wear is generally greater at the edges and lower outside surfaces—Extra cover thicknesses at these points give Republic Belts added protection.

It takes more than a conveyor belt purchase to reduce your material handling costs.

The belt must be constructed right, installed right and serviced right.

Selection, application and service are items best left to an expert. Your Republic Distributor is that man.

He is prepared to make specific recommendations to save you time and money. Contact him today for a free analysis of your plant needs. He can quickly tell whether or not you're getting maximum benefits from present installations, and, if trouble exists, he's fully qualified to suggest corrective changes.

For 50 years Republic Rubber has specialized in Industrial Rubber Products, making all types of hose, belting, molded and extruded rubber products.

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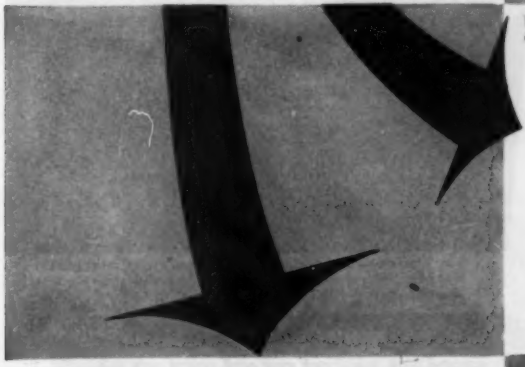


2. MAKE SURE YOUR BELT IS PROPERLY INSTALLED & MAINTAINED—*full facts from your Republic Distributor*

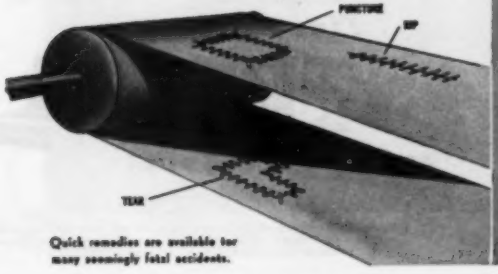
WRONG LOADING

WRONG

CORRECT LOADING

RIGHT

3. NEVER DISCARD DAMAGED BELTS WITHOUT CONSULTING YOUR REPUBLIC DISTRIBUTOR ABOUT POSSIBLE REPAIRING



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This month's report is on: **4-6% CR.-MO.**

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Silmo	Sicromo 3	Sicromo 9M	35-15*
DM	4-6% Cr.-Mo.	18-8 Stainless	16-25-6*
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	

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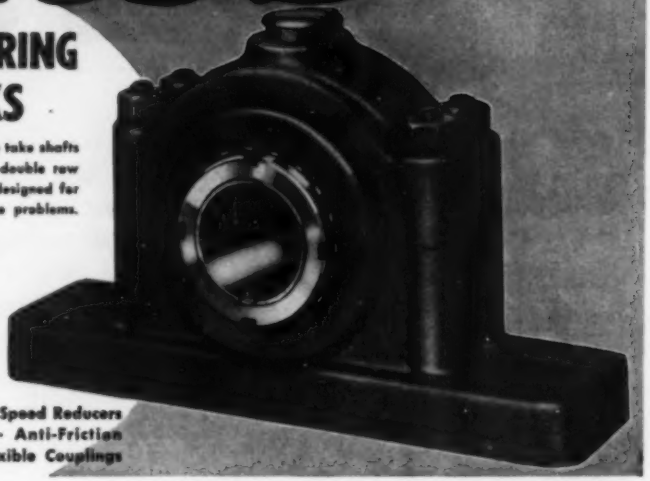

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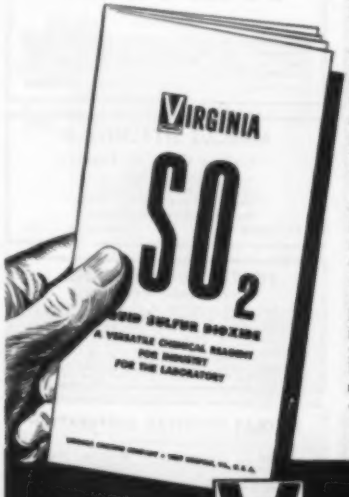

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MECHANICAL ENGINEER or Chemical Engineer with good mechanical background, preferably with a few years experience in the Chemical Process Industries or equipment design, wanted by progressive design and fabricating concern in western Pennsylvania. Please give complete details of education and experience. P-1854, Chemical Engineering.

ENGINEER—MECHANICAL or Chemical Engineer with 5 to 10 years design and production experience desired by Chemical Equipment Industry located in Western New York for design and executive duties. Write or call for additional information and interview. Lapp Insulator Co., Inc., Le Roy, N. Y.

EMPLOYMENT SERVICES

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 260 Dun Bldg., Buffalo 2, N. Y.

SALARIED PERSONNEL, $3,000-$25,000. This confidential service established 1927, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. B, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

ANALYTICAL CHEMIST. Mature. Widely experienced, metals, ores, silicates, industrial chemicals. PW-1358, Chemical Engineering.

(Continued on page 417)

AVAILABLE
SALES ENGINEERS

Specializing in chemical process equipment desire additional quality accounts for our expanding organization in St. Louis area.

BA-1347, Chemical Engineering
120 No. Michigan Ave., Chicago 11, Ill.

ENGINEERS

Chemical - Mechanical - Piping - Process

Long term openings in permanent offices located at Cleveland, Ohio and Frederick, Maryland offering good salary plus overtime (forty eight hour week) for qualified Engineers, Group Leaders and Designers experienced in one or more of the following phases of industrial plant design:

PROCESS PIPING
INSTRUMENTATION
PROCESS EQUIPMENT LAYOUT
PACKAGING
AIR CONDITIONING
PLUMBING
TANKS AND VESSELS
BOILER HOUSES
PLANT LAYOUT
CONVEYORS
HEATING AND VENTILATION
SPRINKLERS
WATER TREATMENT

Limited number of openings for Estimators experienced in Mechanical and Chemical installations as well as building construction.
Also have a number of openings in our Cincinnati and New York City offices for similar type personnel.
Excellent working conditions with paid vacations, sick leave plan and participating Group Insurance Program.
Please submit complete resume stating experience, education, salary required and date available to:

The H. K. Ferguson Company
Engineers and Builders
Ferguson Building — Cleveland 14, Ohio

WANTED

Construction Engineer

(Mechanical or civil) for process plant. Experienced in heavy construction, including buildings, piping, and machinery installation.

Also, Design Engineer

(Mechanical or civil) for process industry. Familiar in heavy industry plant construction, including design, equipment specifications, and machinery installations.
These positions in modern, expanding plant in northern Ohio River valley. Attractive insurance and pension plans, desirable community, excellent opportunities for competent men.

P-1786, Chemical Engineering
330 W. 42nd St., New York 18, N. Y.

MANUFACTURER WANTED

Are you interested in expanded sales in the chemical equipment and process fields? Two sales-engineers having fifteen years' experience, each with separate nationally prominent equipment concerns, are organizing a sales office in New York. We have developed custom and standard equipment sales in the millions and count among our personal friends hundreds of live buying contacts, large and small, in industry, government and export. Among these are the most desirable accounts in the East. This wealth of contacts, training and experience can be yours without any investment in cost or time.

If you have a fairly well equipped shop, can fabricate competitively and conduct business using ethical engineering practices we can accelerate your progress through profits. Because we are top-flight engineers as well, we will establish you in a broader range of sales by an intensive promotion of your present lines and by developing for you newer and more lucrative products.

If you are the manufacturer we would like to represent we can show you in black-and-white the unusual opportunity being offered by this hard hitting, ground covering, well connected team.

RA-1811, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

SALES REPRENSENTATION

In Pennsylvania-Ohio Area

• Established sales engineers want additional top notch items for the process industries.

RA-1912, Chemical Engineering
330 W. 42nd St., New York 18, N. Y.

SALES REPRESENTATION AVAILABLE

One of our clients—well established sales engineers in Chicago and Mid West—is interested in additional accounts for equipment used by the Steel, Chemical, Oil and General Industries.
Please address inquiries to:

First United Broadcasters,
201 North Wells St., Chicago 6, Illinois

OPPORTUNITIES for EXPERIENCED TECHNICAL PERSONNEL

ATOMIC ENERGY INSTALLATIONS

Oak Ridge, Tennessee
Paducah, Kentucky

ENGINEERS

DESIGN-DRAFTING—chemical plants, structures, piping, utilities, alterations.

POWER—design, testing, construction of large electrical power generation and distribution installations.

MACHINE DESIGN—jigs, fixtures, gadgets, remote control equipment.

PROCESS—chemical process and equipment design, vacuum or high-pressure systems, pilot plant operation.

MAINTENANCE—supervision of shops, work order scheduling, chemical process maintenance.

CONSTRUCTION—plant design and construction, co-ordination of procurement and installation of process equipment.

SAFETY—welding inspection, hoist and vessel inspection, fire protection.

NUCLEAR REACTORS—chemical and mechanical engineers for design, development, construction.

INSTRUMENTATION—design, development and industrial application of electronics and pneumatic instruments.

AIR-CONDITIONING — HEATING AND VENTILATING—design, installation, maintenance of plant systems.

CHEMISTS, PHYSICISTS, METALLURGISTS

Research, development, and production in nuclear technology, gaseous diffusion, and related fields.

Minimum educational requirement—
B.S. degree, or its equivalent.

Salary commensurate with training and experience.

Central Technical Personnel Office
Carbide and Carbon Chemicals Company a Division of
UNION CARBIDE AND CARBON CORPORATION
Post Office Box P
Oak Ridge, Tennessee

POSITIONS WANTED

(Continued from page 446)

CHEMICAL ENGINEER with twenty-five years experience in Glass Manufacturing as Manager and Executive now open for engagement full time, part time, permanent or temporary. PW-1857, Chemical Engineering.

CHEMICAL ENGINEER BS have a large variety of experience to offer. Not only a knowledge of processes but of instruments, design, equipment, and maintenance. Can improve operations and supervise people. Prefers position in the Southwest. PW-1891, Chemical Engineering.

ANALYST: EXPERIENCED ores, steel and alloys, Laboratory or production Chemist. PW-1889, Chemical Engineering.

SELLING OPPORTUNITIES WANTED

SALES REPRESENTATION: Sales Engineer, Philadelphia, covering Power and Process Industries in Eastern Pennsylvania, South Jersey and Delaware, desires additional account. RA-1698, Chemical Engineering.

MANUFACTURERS - FINANCIALLY responsible party wants exclusive distributorship in Los Angeles for your chemical products used in industrial plants or may consider only representation if product is favorable. Complete details, please. RA-1861, Chemical Engineering.

CONTRACT WORK

Custom grinding
Well-established company in New Jersey offers facilities for fine grinding of metallics and non-metallics to flake, chip and grain forms. Specialists in hazardous products. Packing, mixing and shipping facilities available. CW-1856, Chemical Engineering.

PATENTS

CONSULT: Z. H. POLACHEK,
Reg. Patent Attorney, 1234 Broadway, New York 1, N. Y.

Additional Position Vacant Advertising on pages 446 and 448

WANTED
PRODUCTION SUPERINTENDENT

Graduate Chemical Engineer or Chemist, 5-8 years experience in direct production supervision of synthetic organic operations for the position of Production Superintendent of the Synthetic Organic Chemicals department in a new and growing chemical manufacturing plant. Scholastic record should indicate above average technical ability. Several years experience in field of process development on synthetic organic processes would be of value. Must have experience and ability for smooth handling of personnel, and demonstrated ability to work with chemists and engineers in the planning of effective utilization of existing equipment for new processes.

Location Ohio Valley in branch plant of major chemical company. Replies will be considered confidential and should include complete resume of personal qualifications, work experience and salary expected.

F-1805, Chemical Engineering
330 W. 42 St., New York 18, N. Y.

CHEMICAL ENGINEER WANTED

We are looking for a young graduate with some experience in resins for laminated plastics. Applicant must have executive ability. This is an opportunity for a man now with a large organization who desires to accept broader responsibilities in a smaller company. Desirable location in the East. All replies will be held confidential. Our organization knows of this advertisement.

Write c/o Box P-1823, Chemical Engineering
330 W 42 St., New York 18, N. Y.

Plant & Maintenance Engineer

Experienced, for work in continental United States. Some traveling necessary. State salary expected, age, experience and date available for work. *Write*

Box CE 1130, 221 W. 41 St., NY 18

PLANT SUPERINTENDENT
PLANT ENGINEER
PLANT MASTER MECHANIC and
CHIEF ELECTRICIAN

Wanted for permanent positions with large new Potash operation. Excellent opportunity. Location: Southwest. Reply

P-1782, Chemical Engineering
68 Post St., San Francisco 4, Calif.

CHEMICAL or MECHANICAL ENGINEER

Graduate from a recognized college and experienced in machine design wanted for a permanent position in Research Department of a well established company engaged in the manufacture of fibre board and roofing composites. Location Western New York. Please submit resume, salary requirement and photo if available.

P-1822, Chemical Engineering
330 W. 42nd St., New York 18, N. Y.

CONSTRUCTION SUP'T & ENGINEER

Technical college graduate, well-experienced in building construction and installation of equipment; willing to travel to locations in United States. State age, salary expected, experience in detail, and date available to begin work. Write, Box CE 1157, 221 W. 41 St., N. Y. 18

REPRESENTATIVES WANTED

Large midwest manufacturer of industrial, chemical and process mixing equipment desires sales representation for territory available in Western Pennsylvania, West Virginia, Southeastern states and North Central states. In first letter advise qualifications, background, and territory now covered. Individuals, or established manufacturers representative organizations considered.

RW-1417, Chemical Engineering
520 N. Michigan Avenue, Chicago 11, Ill.

SALES ENGINEER

A well established heat exchanger manufacturer desires live wire manufacturer representatives to handle its products in the mid-west, eastern seaboard, and southern states. Advise all particulars.

RW-1708, Chemical Engineering
330 West 42nd St., New York, N. Y.

WANTED TO BUY
For Cash

Electric Motors, AC
Electric Motors, DC
Motor generator sets
Transformers
Oil Circuit breakers
Control Equipment

We specialize in new totally enclosed and explosion proof Motors.

FOR SALE
New and Used

Gearhead motors
Explosion proof motors
Totally enclosed motors
Slip ring motors
Squirrel cage motors
Motor generator sets
DC motors

POWER EQUIPMENT COMPANY
8 Cairn Street, ROCHESTER 2, N.Y. P.O. Box 534

CHEMICAL PLANT
WANTED

We are now manufacturing over $20,000,000 in various lines and wish to expand by acquisition of assets or stock of one or more industrial companies. In our negotiations the sellers' problems and wishes will receive full consideration. Present personnel will normally be retained.

Address all replies

"Confidential" C. J. GALE, Sec.
233 Broadway, N. Y. 7, N. Y. BA 7-1819

AVAILABLE . . .

CUSTOM REFINING FACILITIES

- Distillation
- Extraction
- Separations
- Fractionation

Drum Lots—Tank Cars

WANTED . . .

- All Types of Crude Mixtures
- By-Products, Residues, Wastes
- Contaminated Solvents

TRULAND CHEMICAL & ENGINEERING CO., INC.
Box 426, Union, N. J. UNionville 2-7360

COMPLETE PLANTS OR SURPLUS SECTIONS OF ENLARGED PLANTS
Wanted for Liquidation

Preferably in the following Industries:

Petroleum Refining	Gasoline Plants
Chemical	Petrochemical
Recycling Plants	Tank Farms
Pipe Lines	Utility Plants

Compressor Stations

OR SINGLE PIECES OF REFINERY EQUIPMENT

WRITE - - - PHONE - - - WIRE
Howard Kinslow

KINSLOW POWER & EQUIPMENT, INC.
817 So. Boulder Strode Building
Phone 5-5914
Tulsa 14, Oklahoma

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Buyers of

- Copper Basis
- Copper Oxides
- Copper Catalyst
- Copper Powders

OPELL METAL ASSOCIATES
4 E. 41 Street New York 17, N. Y.
MUrray Hill 3-3421-2-3

Compressors Wanted
STATIONARY - PORTABLE
LARGE OR SMALL
L. W. BAUER
265 Essex Avenue Bloomfield, N. J.

WANTED
Model H 7 or Model L 6
NASH VACUUM PUMP
LUBRIZOL CORP.
Box 3057 Cleveland 17, O.
RE. 1-2290

WANTED

50 Gal. Jacketed Baker Perkins Mixer in good condition.
Type V or VI
Class BB
Sigma Blades

W-1794, Chemical Engineering
330 W. 42nd St., New York 18, N. Y.

BOUGHT **SOLD**
Glycols—Cellosolves—Ethanolamines
Phthalic—Maleic—Paints
Titaniums—Bichromates—Dyes—Colors
Soda Ash—Caustic Soda, etc.
CHEMICAL SERVICE CORP.
80-84 Beaver St. New York 5, N. Y.

IF THERE IS

Anything you want

that other readers of this paper can supply

OR—

Something you don't want

that other readers can use, advertise it in the

Searchlight Section

Auction Advertising—page 457

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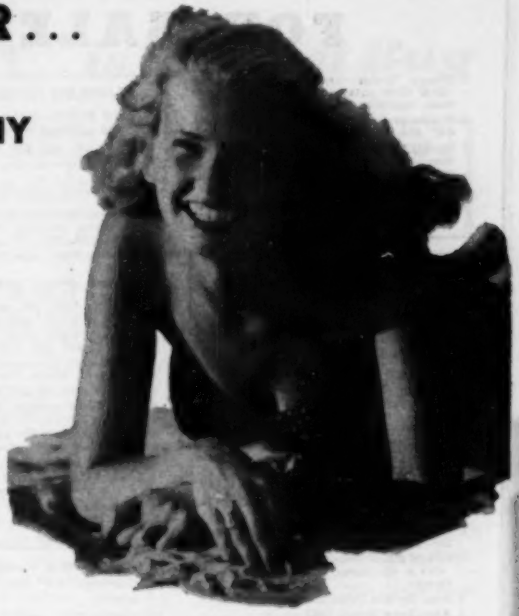
THERE ARE TWO GOOD REASONS WHY

GELB

IS THE BEST BUY:

VALUE AND SAVINGS



THE GELB GIRL SEPTEMBER 1951

2—Swenson-Walker Stainless Steel Jacketed Crystallizers, constructed of 316 Stainless Steel, each Crystallizer equipped with 4-10' sections.
8—Dowington Stainless Steel Heat Exchangers, 500 sq. ft. each.
1—Nickel Jacketed Vacuum Kettle, 65 gal. cap.
2—Stainless Steel Open Top Jacketed Kettles with Stainless Steel Jacket, 20 and 50 gal. cap.
2—Stainless Steel Packed Columns 30" x 32'.
1—Stainless Steel Hydrogenator, 360 gal. cap. 250 lbs. PSI.
1—Niagara Stainless Steel Filter, 146 sq. ft.
2—Sperry Rubber Covered Plate & Frame Filter Presses, 24" x 24" Open Delivery, 14 Chambers.
2—Stainless Steel Jacketed Vacuum Kettles, 250 gal. cap.
1—Nickel Jacketed Kettle, 400 gal. cap.
1—Nickel Jacketed Vacuum Kettle, 10 gal. cap.

3—Mikro Atomizers, Stainless Steel construction, #5 & #6.
1—Pfaudler Glass-lined Evaporating Dish, 12 gal. cap.
1—Sperry Bronze Plate & Frame Filter Press, 18" x 18", 21 chambers.
3—Stainless Steel Jacketed Vacuum Kettles, 250 gals. cap. each.
4—Rubber-lined Storage Tanks, 1,000 gals. cap. each.
1—Tolhurst Stainless Steel Suspended type Centrifuge, 40" Imperforated Basket.
10—Sharples Super Pressurite Centrifuges #6.
1—Sharples Super Pressurite Centrifuge, Stainless Steel Bowl, Model #18Y.
1—Jacketed Vacuum Autoclave, 600 gal. cap. with Agitator.
1—Blaw-Knox Jacketed Autoclave 3' x 4'2" with Agitator.
1—High Pressure Steel Autoclave, 900 psi., 3' x 4' with Agitator and Motor Reducer.
2—Blaw-Knox Jacketed Autoclaves with Agitators, 300 and 500 gal. cap.
1—Gemco Copper Conical Blender, 3½ cu. ft.
1—Kewanee 125 H. P. Boiler, 125 lbs. pressure.
1—Buflovak Vacuum Shelf Dryer, 7 Shelves.
2—Black & Clawson Double Drum Dryers, 28" x 5'.
1—Louisville Rotary Steam Tube Dryers, 8' x 50'.
2—Buflovak Vacuum Drum Dryers, 24" x 20".
2—Buflovak Vacuum Drum Dryers, 5'10" x 10".
3—Louisville Rotary Steam Tube Dryers, 8' x 25'.
1—Buflovac Double Drum Dryer, 32" x 90".
1—Buflovak Double Drum Dryer, 24" x 36".
1—Fitzpatrick Stainless Steel & Bronze Model D Comminuting Machine.
3—Buflovak Flakers 5' x 12'.
1—Ruggles Coles Direct Fired Kiln 7½' x 80'.
1—Royal #1 Perforated Extruder, with heating unit.

1—American Locomotive Stainless Steel Heat Exchanger, Model Twin Double Pipe, Size 3½ x 27' x 24.
4—Steel Heat Exchangers, 800 sq. ft. each.
4—Sperry 36" x 36" Recessed Type Filter, centre-feed, open-delivery, 42 Heresite covered Plates.
3—Vallez Filters, #7E, 2B & 3.
10—Aisop Bronze & Brass Filters, Model #PAK 12-4.
1—Sperry Aluminum Filter Press, 18" x 18", 9 Chambers.
1—Sperry 42" x 42" Wooden Plate & Frame Filter Press, Closed Delivery, 54 Chambers with hydraulic closing device.
1—Shriver Cast Iron Jacketed Plate & Frame Filter Press, 36" x 48", 49 Chambers.
1—Sperry Aluminum Filter Press, 24" x 24", 22 Chambers.
1—Artesian Metal Works Steel Jacketed Kettle, 1000 gal. cap. with agitator.
2—Buflovak Cast Iron Jacketed Kettles, 1250 gal. cap. each.

1—Stainless Steel Jacketed Vacuum Kettle with agitator, 250 gal. cap.
1—Stainless Steel High Pressure Kettle, 360 gal. cap.
2—Patterson Jacketed Vacuum Autoclaves, 4' x 10' with Drives and Motors.
1—Stainless Steel Jacketed Reactor, 550 gal. cap. with Stainless Steel Condenser & Stainless Steel Packed Column.

1—Eppenbach Stainless Steel Celloid Mill, Model QV-7.
1—Ross 50 gal. cap. Change Can Mixer.
12—Stainless Steel Storage Tanks 500 gal. cap. Unused.
2—Shriver Cast Iron Filter Press, 36" x 36", Closed Delivery, 35 & 36 Chambers.
1—Sperry Cast Iron 20" x 20" Filter Press, Recessed Type, 55 Chambers, Open Delivery.
1—Copper Jacketed Kettle, 6' x 8' with agitator.
6—Cast Iron Jacketed Kettles, 215 to 850 gal.
1—J. P. Devine Vacuum, Jacketed Kettle, 2000 gal. cap.
8—Steel Electrically Heated Kettles, 450, 900 & 1000 gal. cap.
10—Pfaudler Jacketed Glass-Lined Kettles, 380, 490 & 1750 gal. cap.
1—Banbury Mixer #1 with 50 Hp motor.
3—Baker Perkins Double Arm Mixers, 200 gal. cap., sigma blades.
2—J. H. Day Mogul Type Mixers, 2½ & 5 gal. cap.
5—Simpson #0 Intensive Mixers, "Unused".
1—Simpson #1 Mixer.
1—Day Pony Mixer, 15 gal. cap.
1—Patterson Porcelain Lined Pebble Mill, Type D, with 25 HP motor.
3—Hardinge Conical Ball Mills, 9' x 30", 9' x 22" and 6' x 22".
1—Abbe Engineering Silex-Lined Pebble Mill, 6' x 12'.
1—Abbe Engineering Buhrstone-Lined Ball Mill, 5' x 4'.
1—Ball Mill, Stone-Lined, 7' x 9'.
2—Mikro Pulverizers #1 SK.
1—Mikro Stainless Steel Pulverizer #2 TH.
3—Stainless Steel Storage Tanks, 50, 150, & 221 gal. cap.
1—Steel Storage Tanks, 10,000 gal. cap.
2—Copper Columns, 36" x 80".
1—J. H. Day #71 Re-Ball Jacketed Stainless Steel Gyrating Screen Cooler.
2—Orville Simpson #41, Rotex Screens.

Established 1876

R. GELB & SONS, Inc.,

CHEMICAL, RUBBER, OIL, PLASTIC and FOOD PROCESSING MACHINERY

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FOR SALE

1 Illinois Water Treating System, 500 GPH flow rate, complete with Zeolite tank, controls, etc.

1 Hardinge Conical Ball Mill, Steel Liner, 4'6" dia. x 24" long, complete.

3 Sprout Waldron Attrition Mills, double disc—sizes 18 and 36.

1 Williams Hammer Mill, type AK; size A, stainless steel.

2 Mikro Pulverizers—#251, #17.

4 INDUSTRIAL FILTER & PUMP MFG. CO. Pressure leaf filters, type RB-2, size 18 x 48, approx. 68 sq. ft.; rubber lined tank, bronze baffles. With slurry tank, pump & motor.

2 Sweetland Filters—#2 and #5.

1 Swenson Rotary Continuous Vacuum Filter: Precoat type, 6' dia. x 9' face, rubber covered and lead acid proof construction.

10 Filter Presses, 12" to 36", C. I., P&F.

2 Louisville 8-roll Continuous Grains Presses, 24" and 36".

1 Davenport Rotary Grains Presses 3A.

1 Vacuum Pan Dryer or crystallizing Kettle, 10' dia. x 3' deep.

2 Pan Dryers or crystallizing Kettles, 10' dia. x 3' deep and 5' dia. x 30" deep.

1 Stokes #39A Vacuum Rotary Dryer, 18" dia. x 42" long, with pump and condenser.

2 Atm. Double Drum Dryers, 22" x 38".

1 Atm. Tray Dryer, 1080 sq. ft.

1 Cummer Rotary Indirect Hot Air Dryer, 4' dia. x 30' long, complete.

LIQUIDATING DISTILLERY

Distillation and processing equipment; Grain equipment and storage bins; screw conveyor and bucket elevators; copper tubular condensers; double pipe beer cooler; bronze pumps; copper tanks, steel tanks, etc.

Write for list

1 Porter heavy duty jacketed double worm mixer—75 gal.

2 Read heavy duty double arm jacketed mixers, 200 gal. working cap.—1 stainless lined.

1 Read jacketed Ribbon Mixers, 80 gal.

1 Broughton Powder Mixer, double arm, 2400#.

4 Selectro Vibrating Screens, stainless steel, 2' x 7', double deck, enclosed.

1 Rotex Screen, size 21, single deck.

2 Kux Mach. Co. Model 25 Rotary Pellet Presses, 21 & 25 punch—with motor and vari-drive.

9 Stokes Rotary Pellet Presses, 18 punch —B-2, D-3, D-4.

1 Byron Jackson Deep Well Pump, 150 GPM—325' head, NEW.

1 Ingersoll Rand Bronze Centrifugal Pump #5ALV, 40 HP motor, 850 GPM at 140'—NEW.

2 Ingersoll Rand Bronze Centrifugal Pumps, #1½-BVH, 30 HP motor, 300 GPM at 230'.

STAINLESS STEEL KETTLES

20# Jacket—Vertical Agitators

3—3700 gal. cap. 7'6" dia. x 7'6" high.
2— 950 gal. cap. 63" dia. x 78" high.
Type 347 stainless steel shell; cast iron top.

70 Stainless Steel and Stainless Clad open top, steam jacketed kettles—10, 20, 40, 60, 80, 100, 150, 200 gal. sizes.

2 Stainless Steel, type 316, closed tanks—300 gal.

20 Stainless Steel, type 304, open top tanks—6, 15, 30, 50, 60, 100, 150, 200, 300, 500, 1000 gal. sizes.

1 Stainless Steel, type 347 Autoclave or pressure tank: 250# pr. Elec. heated 650° F: 100 gal. cap., 17¼" dia. x 9' high.

5 Aluminum Tanks, 743 to 1485 gal.

2 Monel Tanks, 60 gal. bolted top, coils.

3 Glass lined welded steel tanks, horiz., 5100 gal.

1 Dopp Cast Iron 300 gal. kettle, jacketed & agitated, open top.

1 Glass Lined Kettle, Jkt'd. & Agit. 50 gal.

1 Steel Autoclave, 130 gal., 23" dia. x 74" deep, 125# int. pr. 15# jkt. pr.

1 Steel Autoclave, 50 gal., 23" dia. x 30" deep, 300# int. pr. 100# jkt. pr., agitated.

1 FEINC Rotary Vacuum Filter, string discharge, 4'6" dia x 6' face, aluminum

2 Suspended 48" dia. Basket centrifugals, Bird & Troy.

2 DeLaval #600 Oil Purifiers.

1 Steel Vacuum Kettle, 300 gal. agitator, 50# oil jkt.

2 Copper Vacuum Kettles, 100 gal., 48" dia., jacketed, agitated.

1 Copper Vacuum Evaporating Pan, 6' dia.—jacketed and coils.

1 Struthers Wells Evaporator, 100 sq. ft.

2 Worthington 6½ x 6 Vacuum Pumps.

2 Spencer Turbine Co. Gas Boosters or Compressors, stainless steel, 30 HP motor, 600 CFM at 80 oz. pr.

2 Ingersoll Rand Type PB-536 Blowers, 4000 CFM at 3 lb. pr.

3 Ammonia Compressors—9 x 9, 7½ x 7½, 8 x 8.

3 Shell & Tube Condensers: 39 & 200 sq. ft. Stainless Steel: 487 sq. ft. copper.

2 Copper Beer Still Columns with condensers, etc., 24" dia., 30" dia.

6 Copper Bubble Cap Columns, 18" dia. to 48" dia.

6 Aluminum Columns, Bubble cap, etc.—24", 27" & 36" dia.

1 Steel Bubble Cap Column, 82 plates, 30" dia.

2 Copper Extraction Stills—40 GPH & 70 GPH.

3 Water Stills, 30 GPH & 250 GPH.

5—Vertical Jacketed Pressure Tanks—steel — 30# steam jacket — 4mm vacuum internally:
3—34" ID x 15' H (approx. 700 gal.)
1—23" ID x 10' H (approx. 230 gal.)
1—23" ID x 9' H (approx. 193 gal.)

PERRY EQUIPMENT CORP.

1413 N. 6th St. STEVENSON 4-7210 PHILA. 22, PA.

GOOD BUYS

FOR IMMEDIATE DELIVERY

New Swenson Continuous Evaporator, S. S. Steam Chest, Copper Tubes 7' x 16', S. S. Vapor Head. Complete Unit.
J. W. Day Jkt'd. Vacuum Mixer, 5 gal. Working, S.S. Sigma Blades & S.S. Bowl, Like New.
Type 347 S.S. Tumbling Barrel, 5' x 5'.
9 Shriver & Sperry Filter Presses, 9" to 42".
Day 15 Gal. Jkt'd. Mixer, 2 corred Masticator Arms, with reducer & 5 HP motor.
Groen 200 Gal. S.S. Jkt'd. TIR Kettle.
S. & J. Rotary Cutters, #0, #1½ S.S., #2 & #2½ with AC motors, with or without knife sharpeners.
Hardinge 7' x 48" Belgian Block Lined Mill, with Falk reducer & 50 HP AC motor.
Oliver 8' x 12' Continuous Filter, complete.
Bird 40" Suscended Type Centrifugal, rubber covered, plow & bottom dump, with motor.
S.S. Fitz Mill, Model D, with 5 HP AC motor.
430 Gal. Steel Roaster, 48" x 48", Jkt'd. & Agtd., with explosion proof motor.
Bird 40" x 60" Solid Bowl Centrifugal Filter, rubber covered. Like New.

WHAT HAVE YOU FOR SALE?

For BETTER BUYS & SERVICE
Phone SOuth 8-4451 - 9264 - 8782
You Can BANK on

EQUIPMENT CLEARING HOUSE, INC.
289-10th ST. BKLYN 15, N. Y.

ROTARY DRYERS

XB-10—70" x 45' Indirect Heat Buggies-Coles Direct Heat: 4' x 30', 4' x 45', 4½' x 40', 5' x 50', 6 x 35, 6'9" x 60', 7' x 50', 8' x 70' & 10' x 90'.

MISCELLANEOUS EQUIPMENT

18" Three Stage Wetherill Type Magnetic Separator
Dings 60"—3 Roll Type L.E.
20", 5', 10' & 15' Mechanical Air Separators
6' x 22' Hardinge Ball Mill, Screw feed
5' x 4' Emico Ball Mill
#0 & #1 Raymond Automatic Pulverizer
1 x 45, 6 x 60, 8 x 120 & 9 x 170 Rotary Kilns
2—5' x 22' Silex Lined Tube Mills
4—11'6 x 14' Oliver Continuous Filters
3—6' x 4' Dorreo Continuous Filters
24x18A Jeffrey Hammer Mill
#1 & 1½ Stutevant Ring Roll Mill
Hercules Junior 3 Roll Pulverizer
Clyde-Kuntz Continuous Hydrator
7 Elec. Air Compressors, 1300, 2100 & 2374 Ft.
125—8000 & 10,000 Gal. Tank Cars
45 Ton Plymouth Diesel Locomotive
2450 pt Chgo Pneu. Elec. Compressor

STANHOPE, 60 E. 42nd St., N. Y. 17, N. Y.

For Sale **For Sale**

1—Baker-Perkins 150 Gal. Stainless Steel Mixer, double-arm, sigma blades, with 40 hp explosion-proof motor.
1—Baker-Perkins 100 Gal. Stainless Steel Mixer, double-arm, sigma blades, with 25 hp explosion-proof motor.
1—J. H. Day #2, 75 Gal. Brighton Mixer.
5—Pebble Mills 40 to 500 Gal.
10—Pony Mixers 8, 15 and 40 Gal.
1—Read Lab Stainless Steel Motor Driven Dough Mixer, double-arm, sigma blades.
HIGH SPEED Roller Mills 9"x24" to 10"x40".
1—Motor Driven Belt Conveyor.
3—6" Premier Colloid Mills, watercooled.

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STAINLESS STEEL TANKS

2—1000 gal. new vertical storage 5' diam.
3—1000 gal. used stainless lined wood
1—400 gal. used stainless jacketed 48" x 5'
1—275 gal. armsure, stainless 41" x 48" Misc. Stainless Valves & Fittings
3—5000 gal. horiz. rubber lined steel tanks

SEIFERT MACH'Y CO.
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1 Ton Wolf Horizontal Mixer

Complete with 15 H.P. Motor, Starter, V Belt drive $850.00.

1 Wolf streamline Gyro sifter, complete with elevator and hopper, $750.00.

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CENTRIFUGALS

Motor Driven

3—AT&M 60" center slung, S.S.
2—Fletcher, Tolhurst 40" solid basket, steel
1—AT&M 40" Suspended, 304 S.S.
1—AT&M 40" Suspended, Bronze
1—Tolhurst 32" Suspended perforated bottom discharge, monel
1—AT&M 20" rubber-covered
2—Bird 36" x 30" solid bowl, Continuous, rubber-covered
1—Bird 18" x 28" Solid bowl, Continuous Hastelloy & Neoprene
1—Sharples #16 S.S.
3—Sharples #6 Steel
1—DeLaval AC-VO

FILTERS

1—Oliver monel 8'x10' Rotary Vac.
2—Valles #49 Pressure Filters, 41 leaves.
3—Sweetland #12 with 72 S.S. leaves.
1—Sweetland #7 with 20 leaves.
1—Sweetland #2 steel, 17 leaves.
6—Oliver Rotary 11'6"x14', 8'x13', 8'x8'.
1—Feinc 8'x12' Rotary String Vacuum, steel
1—Oliver 3'x4' steel Precoat Rotary Vac.
2—Shriver 24"x24" P&F, 20 chambers, washing.
3—Shriver 18" recessed, 20 chambers.
1—Shriver 42" Everdur P&F, 36 chambers.
2—Smith Vale, Johnson 24"x24" recessed, 22 chambers.
1—Sperry Aluminum 30"x30" P&F, 26 chambers, with hydraulic closure.
1—Sperry Aluminum 24"x24" P&F, 22 chambers.
2—Sperry Type 30"x30", recessed, 25 C.I. chambers.
2—Shriver 12"x12" Aluminum P&F, 12 chambers.
10—Shriver Skeletons 42", 30", 24", 18".

PULVERIZERS

1—Raymond 3-Roll High Side Mill.
2—Bauer 36" Attrition Mills, each with 2—50 HP motors.
1—Raymond #45 Imp. Mill.
7—Abbe 6'x8', 5'x3', 4'6"x3'6", 3'9"x3'6", 2'9"x3' Pebble Mills.
7—Patterson 8'x10', 6'x8', 4'x5', 3'6"x4', 3'x4' Pebble Mills.
1—Mikro Pulverizer #18H.
3—Colloid Mills 6" and 4" dia., S.S.
1—Williams 20"x18" Hammer Mill.
1—Jeffrey 20"x12" Type B Hammer Mill
2—Jeffrey 30"x24", 24"x18" Type A Hammer Mills.
2—Hardinge Mills 10'x36", 6'x22".
3—Day 18"x48", 12"x30", 9"x24", 3-Roll Mills.
3—Raymond 8', 6' and 4' Air Separators.
1—Ball & Jewell #1½ Rotary Cutter
1—Fitzpatrick Model D Comminutor, 3 HP motor.

SCREENS

3—Rotex Double Deck 40"x84", 40"x58", 20"x48".
4—Sprout Waldron 40"x84" Stainless, Single Deck.
8—Tyler Hummer 3'x5' Triple Deck.
1—Tyler Hummer 4'x8' Single Deck with thermionic unit.

KETTLES—TANKS

6—2000 gal. steel jacketed agitated Kettles, 250 psi.
10—Stainless 20 to 500 gal. jacketed.
1—Buflovak 8' dia. Crystallizer.
1—Pfaudler 1000 gal. glass-lined, jacketed, agitated Kettle.
2—300 gal. glass-lined jktd. Agitated Kettles.
1—Patterson 130 gal. jktd. Autoclave, 300# pressure.
1—Buflovak 300 gal. jktd. steel Impregnating Kettle.
2—Day 500 gal. steel, jacketed, agitated Kettles.

SPECIAL OFFERINGS

1—Raymond 3-Roll High Side Mill, double whizzer
1—Baker Perkins 300 gal. Unider Mixer, Size 18, S.S.
1—1000 gal. steel, jacketed, agitated closed Kettle, 50#
1—Baker Perkins 100 gal. Type JNM Double Arm Jacketed Mixer, sigma blades
2—Combustion Eng. 500-gal. Type 347 S.S. jacketed Autoclaves, 300# pressure
2—6' dia. x 30' high S.S. Bubble Cap Columns
4—2000 gal. steel, jacketed, agitated Kettles 200 psi.
1—Link Belt 2'7" x 8' Roto-Louvre Dryer, monel
2—Buflovak 32" x 100" Atmospheric Double Drum Dryers complete with drives, motors and accessories
1—Single Drum Atmospheric 5' x 6' S.S. Dryer
2—Oliver 8' x 10' monel Rotary Vacuum Filters, complete
2—Eimco 3' x 1' Type 316 S.S. Rotary Vac. Filters, complete
1—Link Belt 11'6" x 35' Steel Roto-Louvre Dryer

MIXERS—ALL TYPES

3—Baker-Perkins 30, 9-gal. steam jacketed, Double Arm.
1—Baker-Perkins 2 gal. S.S. Double Arm.
1—Howes 2000# Horiz. Powder Mixer.
10—Day, Robinson 100# to 2000# Powder.
25—Electric Portable Agitators, ¼ HP to 5 HP.
2—Ross, Porter 40 and 30 gal. Pony Mixers.
8—Day Wall Mixers, 150 gal.

BUCKET ELEVATORS

1—Webster 36' centers steel housing, 8" x 6" buckets
2—Link Belt 45' centers, 50" x 20" steel housing, 12" x 8" buckets
2—McCulley 65' centers, 16" x 42" steel housing, 8" x 6" buckets
1—Link Belt 70' centers, 15" x 40" steel housing, 8" x 6" buckets
1—Continuous 75' centers, 24" x 9" buckets on canvas belt
1—Continental 76' centers, 20" x 48" housing, 8" x 12" buckets

ROTARY KILNS AND DRYERS

1—Link Belt 2'7"x8' monel Roto-Louvre Dryer.
2—Bethlehem 8'x125' Kilns, ¾" shell.
4—Rotary Dryers 9'x80', 7'x80', 6'x80', 5'x87'.
1—Traylor 54"x40' Rotary Dryer.
1—Ruggles Coles Style XB10 Rotary Dryer 70'x45'.
1—Ruggles Coles 4'x20' Indirect Heat Rotary Dryer.
4—Louisville Rotary Steam Tube Dryers 6'x30', 6'x25', 30"x20'.
1—Adt. 5'x35' Rotary Steam Tube Dryer.

DRYERS

VACUUM AND ATMOSPHERIC

4—Stokes 6 Buffalo Rotary Vac. Dryers 18"x42", 30"x9', 5'x15', 5'x30'.
1—Stokes Vacuum Shelf Dryer, 6 shelves, 42"x42".
1—P&S Conveyor Dryer, 9' wide x 32' long.
5—Atmospheric Double Drum Dryers, 42"x 120", 32"x100", 32"x80", 30"x84".
1—Single Drum Atmospheric 5'x7.

MISCELLANEOUS

7—Stokes Vacuum Pumps, 15 to 150 CFM.
1—Milton Roy Proportioneer Pump, S.S. and Hastelloy, 10 gpm.
1—Oliver Vacuum Pump, 400 cim.
1—Stokes Combination Condenser & Receiver, 137 sq.ft.
1—Colton Tablet Machine #5½.
3—Stokes Rotary Tablet Machines DD84, DD82, DD2.
1—#1 Anderson Expeller.
2—Nash Hytor Vacuum Pumps to 400 cim.
1—Mitts & Merrill #10 Paper Shredder.
1—Knapp #429 Automatic Carton Sealer.
10—Olivite Duriron & Rubber Centrifugal Pumps, 1½ to 4".

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AUTOCLAVES

2,000 gal., steel, jack'td., 200 PSI (6).
300 gal., S.S. jack'td., 300 PSI (2).
75 gal., steel, agit., 150 PSI.

BINS

10' x 15' str. side, cone.
7'8" x 11'6" x 17'3" (2).
8' x 8' x 14' with 4' U bottom (2).
4' x 5' x 30' (2).

BELT CONVEYORS (TROUGHING)

104' centers 14" w/structural (1).
56' centers 16" belt.
37' centers 16" belt.
29' centers 17" belt.
26' centers 18" belt.
25' centers 18" w/structural.
13' centers 14" w/structural (1).
13' centers 18" belt.
33' centers 36" wide Pan Conveyor.

BUCKET ELEVATORS (STEEL ENCASED)

23' centers 8" x 5" buckets (2).
30' centers 4" x 4" buckets (4).
40' centers 4" x 6" buckets.
65' centers 8" x 3½" buckets.
70' centers 8" x 5½" buckets.
76' centers 8" x 12" buckets.
36' centers 8" x 6" buckets.
45' centers 12" x 8" buckets.

CENTRIFUGES

Bird, 36" x 30", cont. rubber covered, SS. A.T.&M. 60" SS type 316.
Bird, 24", coat. type CH, series 200, steel.
Bird, 40" x 60", solid bowl, rubber lined.

CLASSIFIERS

Dorr, duplex, 4' x 20'.
Flight Separator 30" x 15".

DRYERS

Devine, vac. 2'11, shelf, CI, 170 sq. ft.
Buflovak, drum, 24" x 20', SS & aluminum.
Laboratory Spray, SS, 2'11.
Stokes, 59 AB, 30" x 96".
Turbulaire Spray, Type M.

FILTERS

Eimco, 3' x 1' SS (4).
Oliver, 9' x 10', 230 sq. ft., wood & steel (3).
Fainc String, 8' x 12'.
Oliver, 11'6" x 14', 500 sq. ft., wood & steel.
Sweetland 2'7, 41 tops, 2", 19 leaves.
Plate Frame, 24"—26 fr. Hyd. Clo.

KETTLES

500 gal., SS jack'td. 300 PSI (2).
40 gal., SS jack'td. 40#, hinged covers.

KILNS, COOLERS, DRYERS

3' x 25' x ¼" shell (2).
4' x 16' x ⅛" Iowa Mfg.
4' x 23' x 5/16" Struthers-Wells.
4' x 34" x 5/16" Struthers-Wells.
4'6" x 40' x ⅜" Traylor.
5' x 67' x 5/16" shell.
6' x 14' x 9/16" Struthers-Wells (2 NEW).
6' x 60' x ⅜" shell.
7' x 60' x ⅜" shell.
6' x 60' x ⅜" shell.
7'6" x 60' x ½" shell.
8' x 80' x ½" shell.
11'6" x 35' Roto Louvre.

MILLS, PULVERIZERS & CRUSHERS

6' x 8' Patterson Ball Mill, unlined (1).
6' x 8' Abbe Ball Mills, unlined (2).
4' x 42" Ball Mill.
4' Symons Cone Crusher with dust hopper.
18" x 36" Traylor Bulldog Crusher.
14" x 16" B&S 2-roll Spiked (NEW).
16" x 40", three roll.
22" x 12", four cage, Abbe.
36" Four cage, Stedman.
30" x 24", Jeffrey Hammermill.
36" x 24", Jeffrey.

MIXERS

Ajax, #3 Super, 173 gals.
Champion, type E, size 2, 110 gals.
Binks, type TM60, 100 gals. (2).
Blystone, 48" x 67", 500 gals. (2).
Readco, 1½ SA, 88 gals.
Paddle, double shaft, 140 cu. ft. (NEW).

PRESSES—TABLET

Colton, rotary, type 200 RP (3).
Colton, rotary, type 2 RP (2).
Colton, pelleting, type 3-DT (9).

PRESSURE VESSELS

3,500 gal., 5' x 24' x ¾", 200 PSI riv. (5).
8,200 gal., 5' x 40' x 2", 390 PSI riv. (2).
10,500 gal., 9' x 23' x 7/16", 150 PSI.
25,000 gal., 10' x 40' x 1-7/16", 290 PSI ASME.

SCREENS (SINGLE DECK)

30" x 7'6" Magnetic Shaker (4).
3' x 6' Tyler Hummer vibrating.
3' x 5' Tyler Hummer vibrating.
4' x 8' Tyler Hummer vibrating.
No. 42 Rotex.

STORAGE TANKS

2,300 gal., 5' x 16' x ¼", type 304 SS.
3,000 gal., 5' x 21' x ¼", type 430 SS.
150 gal., 3' x 6'6" x ¼".
1,600 gal., 8' x 7' x 3/16" cone bottom
2,100 gal., 9' x 6'6" x 3/16" cone bottom
13,500 gal., 10' x 21'6" x 1".
15,300 gal., 9' x 32' x 3/16".
16,200 gal., 10'6" x 25' x ¼".

TANK CAR TANKS

6,500 gal., 76" x 27'10" Extra Heavy (30).

TOWERS

36" x 11' Haveg.
24" x 94", rubber lined.
20" x 63", steel.
72" x 29'8", Bubble Cap SS.

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80	100	Worthington HB 6x5
100	135	Ingersoll ESI 8x9
210	100	American AP-1 9½x8
252	30	Worthington HB 12x7
262	75	Ingersoll ESI 10x9
304	70	Ingersoll ESI 15x9
150	350	American 9¼/5½x8
670	125	Worthington 15/9½x12
827	125	Ingersoll 17/10½x14
700	80	Ingersoll 17x12

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4000 gal. Horizontal S.S. Tank, 8'9" x 7'8".
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3000 gal. S.S. Trunk Tanks & Trailers.
8 Ft. Dia. S.S. Vacuum Pan.
S.S. Heat Exchangers, Plate & Surface Type.
100 gal. S.S. Clad Jkt. Kettles, 38" x 52".
500 gal. S.S. Mix Tank, 71" x 36".
300 gal. Copper Tank, 42" x 38".
500 gal. Pfaudler Horiz. Glass Lined Tank, 25'2".
Day Vibrating Screen, 40" x 104", 1 H.P.
28" x 60" to 42" x 120" Double Drum Dryers.
1—60 gal. Steel Kettles, 75-# Jkt., A.S.M.E.
Premier Colloid Mill 6", 7½ H.P. Motor.
Model 10H Nitro Pulverizer, 5 H.P.
75 to 1500 gal. Homogenizers or Viscolizers.
60" Centrifugal Extractors, s.s. baskets & parts.
Model 146C Stokes High Vacuum Pump, 1½ H.P.
1½" and 2" S.S. Centrifugal Pumps.

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8—20,000 GAL. 10'6" x 31' Horiz.
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6—10,000 GAL. 10' x 17'2" Horiz.
4—15,000 GAL. 10'6" x 23'6" Horiz.
4—10,000 GAL. 200 lb. Pres.

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Complete with 100 H.P. 2300 Volt 60 Cycle 3 Phase 3550 RPM Motor and Starter. One unit Brand New, Other Slightly Used.

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1—8' x 12' ALL STAINLESS STEEL Feinc Rotary Continuous Vacuum Filter, string discharge, with blankets and STAINLESS STEEL trough, repulper, receivers, vacuum pump, motors, reducers, etc. ETAO #387.
1—8' x 12' Oliver Lead-Wood Vacuum Filter, Acid-Resisting.
3—Oliver Vacuum Filters, incl. 8' x 12', 11'6" x 14', 11'6" x 18".
2—ALUMINUM Sperry FILTER PRESSES: 1—30" x 30"; 1—24" x 24", Plate and Frame, 45 chambers.
1—#12 Sweetland Filter, 36 leaves on 4" centers.
1—Kilby 39x39 CI Filter Press, open delivery.
1—#5 Sweetland, stainless steel lined, with 30 stainless steel leaves on 2" centers.
1—Sperry, iron, steam heated, 30" x 30", 30 chambers.
6—Shriver-Johnson, iron, plate and frame, 35-40 chambers each.

CRYSTALLIZERS OR RIBBON MIXERS

4—Swenson-Walker Jacketed Crystallizers in 10' sections, (1—70' lg. and 3—80' lg. each with pulley driven gear reducer and 10 H.P. A.C. motor). Units are 24" I. D. x 26" high with ¾" thick steel plate and ¼" steel jackets, steel covers and ribbon agitators.
6—100# to 2000# cap. Ribbon Mixers.

DRYERS

2—Buflovak Vacuum Dryers 5' x 10' with all accessories.
1—4' x 30' STAINLESS STEEL lined Louisville Rotary Dryer with reducer and 10 H.P. motor.
2—Buflovak Double Drum Dryers 32" x 90" complete.
1—5' x 53' Hardinge Co. D. H. Rotary Dryer or Cooler.
1—6' x 50' Louisville welded shell Rotary Steam Tube Dryer with two rows, 54 tubes. Also two 6' x 27' Davenport, same type.

RAYMOND PULVERIZERS

2—5-roll Raymond High Side Pulverizers, including separators, exhausters, cyclones, tubular collectors and inter-connecting piping.

STAINLESS STEEL CENTRIFUGALS

3—42" All Stainless Steel Centrifugals, Amer. T&M Co., each with 5/5 basket, curb, casing, shaft, unloader, and 40 H.P. variable speed Slip Ring 3/60/440 V. 1200 RPM motor with full controls. Suspended bottom discharge type. Now at Newark.

CONTINUOUS CENTRIFUGALS

1—24 x 38" Bird Continuous Centrifugal with solid stainless steel tapered bowl. Other parts of monel.
1—18 x 28" Bird Continuous Solid Bowl Centrifugal, STAINLESS STEEL Bowl, bronze cover. Also 24" x 38" centrifugal with solid stainless steel tapered bowl, other parts of monel.
1—36 x 40" Bird-Laughlin Continuous Centrifugal Filter, STAINLESS STEEL horizontal basket, 25 H.P. motor.

JACKETED KETTLES

65—Aluminum and Stainless Steel. 20 gal. to 150 gal.
1—500 gal. open.
2—1000 steel, closed.
1—3000 gal. steel, closed, agitated.

MISCELLANEOUS

1—Copper Rectifying Column, 6 sections, 30" dia. x 33' high, bubble cap type.
4—Baker Perkins, jacketed MIXERS, 3000 gal. Size 30, type X.
10—Baker Perkins, jac., heavy duty mixers 10 gal. and 300 gals.
1—100 gal. jack., W&P MIXER, heated blades.
6—Ross 20 gal. heavy duty Pony Mixers.
1—3000 gal. Stainless Steel Tank with coil and agitator.
1—Abbe 175 gal. Buhrstone-Lined Pebble Mill.
15—Dry Powder Mixers and Benders, rotary and horizontal ribbon type, 100 to 5000 lb.
1—Pneumatic Scale Automatic Packaging unit, including Tight Wrap, 32 per minute.
1—Sparkler Filter 18-S-12, jack.

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Triangle Package Elec-Tri-Pak, G2C, G2S, A2C, N2CA and A6CA Fillers.

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Stokes 900 Auto. Tube Filler & Closer.

Stokes 2C Cream Filler and Closer.

Filler 1, 2, 4 and 8 Head S.S. Fillers.

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Mikro 4TH, 2TH, 1SH Pulverizers; Jay Bee U1, Schutz O'Neill.

3500 gal. working cap. Steam-Jacketed, Double-Arm, Mixing Tanks for mixing, storing or processing of your materials.

Baker Perkins 200 gal. Unidor S. J. Double Arm Mixer.

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F. J. Stokes, J. H. Day, New Era, Hottman Mixers, from 2 gallons up to 450 gallons, with and without Jackets, Single and Double Arm Agitators.

85-100-150 gal. S.S. Jacketed and Mixing Kettles.

Ross, Day Pony Mixers, 8, 15 gal. caps.

Huhn Steam and Gas Fired Rotary Dryers.

Kent and Lehman, etc. 3 Roll Mills, 12" x 30" and 16" x 40" sizes.

Allis Chalmers, Great Western Sifters.

Pony MX, ML, Auto. Duplex Labelrites; World Rotary and Straightaway Labelers.

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2—Proctor & Schwartz 6 fan automatic Conveyor Dryers, 2 Roll 48" Chilling Unit.
3—Allbright-Nell 6'x35' Atmos. Drum Dryers.
1—Buffalo Vac Drum Dryer 24x20". Also Rotary Vac. Dryers & Vac. Shelf Dryers.
15—Steam, Gas & Electric Dryers, Tray, Truck & Conveyor Types.
9—Rotary Dryers, Direct & Indirect. Also Jacketed & Steam Tube.
New Rotary Dryers, Kilns & Coolers built to order.
1—Raydon Coton Style XB10 Rotary Dryer 78" x 40'.

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5—Tolhurst 48" Suspended Type Centrifugals, Bottom Discharge, Motor Driven.
6—Centrifugals 20", 30", 40" & 48", Steel, Copper, Stainless & Rubber Lined.
12—Sharples Centrifuges #51A Stainless. Also #6.
1—Bo Lawsi Mattlade Clarifiers #200, 300 & 301.

FILTERS

4—SPERRY 30" CORNER FEED IRON FILTER PRESSES.
10—Sperry & Shriver 12", 18", 24", 30", 36", & 42", Iron & Wood Filter Presses.
1—12" Bronze Filter Press.
Extra 36" & 48" Iron plates & frames.
4—Vallez type 60 RB, 41 Stainless covered Leaf Rotating Filters.
Sweetland & Oliver Rotary Vac. Filters.

KETTLES & TANKS

Duetine 1000 gal. closed Jack. agit. steel kettle.
8—Jacketed Kettles 50 to 1000 gals.
1—Struthers-Wells 10 gal. Jack. agit. Autoclave 5 HP motor.
1—250 gal. Lead Lined Kettle.
25—New Stainless Steel Tanks 50 to 5000 gals.
18—Stainless, Alum., Copper, Glass & Lead Lined Kettles & Tanks.
Fermentation Units, Lab. or Pilot Plant & Up.
6—Copper Varnish Kettles 150, 200 & 300 gals.

PULVERIZERS & MILLS

1—#00 Raymond Mill 30 HP., complete.
4—#0000 Raymond Mills.
6—Hammer Mills & Pulverizers 3 to 50 H.P.
1—Schutz-O'Neill 20" Pulverizer. Also #1.
1—Sturtevant 30" Rock Emery Mill.
1—Robinson 22" Attrition Mill.
1—Double Roll Crusher 10" dia. x 14" face.
1—Lehman 4 Roll W. C. 12" x 30" Steel Mill.
2—Lehman & Kent 3 Roll Steel Mills, 9" x 22", 9" x 32", 12" x 30" & 16" x 40".
1—9" x 30" Double Steel Roller Mill.
1—9" x 24" 3 pr. high steel Roller Mill.
3—Hoschin 18" x 36", 4 Roll Granite Stone Mills.
3—Abbe Pebble Mills 8" x 8", 3' x 3½' & 2' x 2½'.
6—Abbe Jar Mills Lab to 12 gal. sizes.
Abbe #3 Rotary Cutter 3 HP. motor.
Luominator #3 Rotary Cutter, 1 HP. motor.
Mikro Pulver. Fitzpatrick Commin. Mills, etc.

MIXERS—ALL TYPES

7—Baker-Perkins heavy duty double arm Jack. mixers, 200 & 9 gals.
12—Hewitz. Mixers 35 to 200 gals. single & double arm.
6—Pony or Paste Mixers, 8, 15 & 40 gals.
1—Century 2 HP. 4 speed Vert. Mixer.
6—Lead & Paste Mixers 50 to 150 gals.
4—Simpson Intensive Mixers 80 to 2-½.
1—Master Drum Type Blender 1000#.
10—Dry Batral Mixers 20 to 2000#.
15—Portable Elec. Liquid Mixers ¼ to 3 HP.

SCREENS & SIFTERS

3—Tyler #38 Jr. Hummer Screens, 20"x30".
1—Rotex Sifter 20"x64", 4 Surface.
2—Gyratory suspended Sifters 20" & 24".

MISC. & SPECIALS

6—French Oil 400 Ton Linseed & Cottonseed Hydr. Presses.
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Average of Plant Run — 1947

SiO_2	99.829
Fe_2O_3	0.036
Al_2O_3	0.072
CaO	0.009
MgO	0.005
L. O. I.	0.072
Total	100.023

Detailed information on Oklahoma's mineral resources is available on request, based on data by the Oklahoma Geological Survey. Map showing location of mineral deposits is also available.

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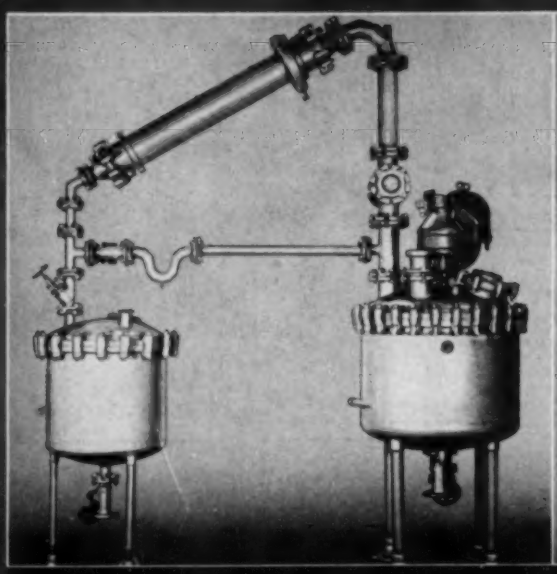

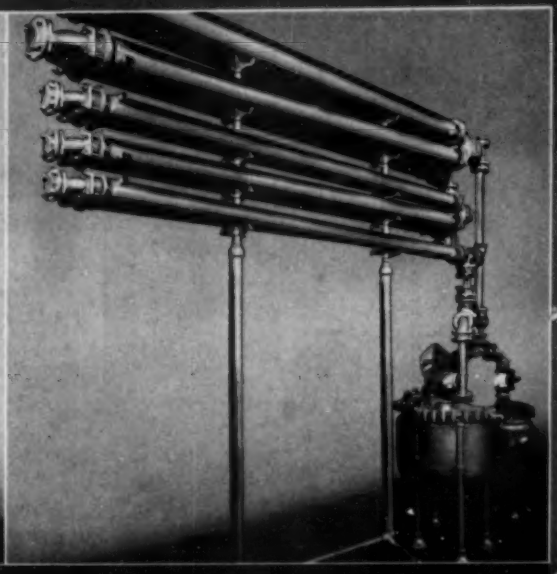

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